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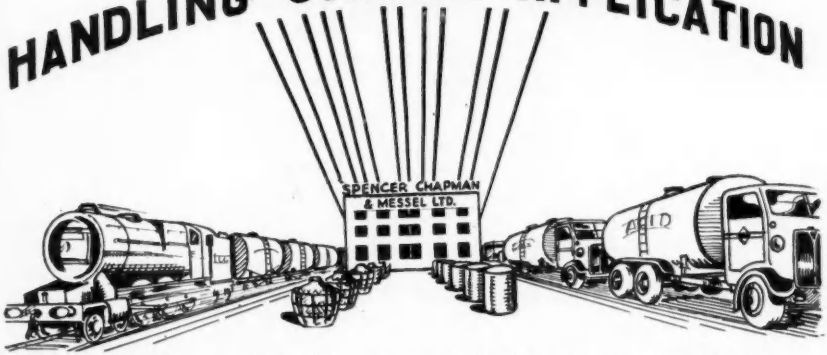
The Chemical Age

VOL LXI 31 DECEMBER 1949 No 1590

ACIDS

HANDLING - STORAGE - APPLICATION



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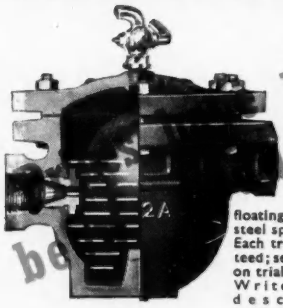

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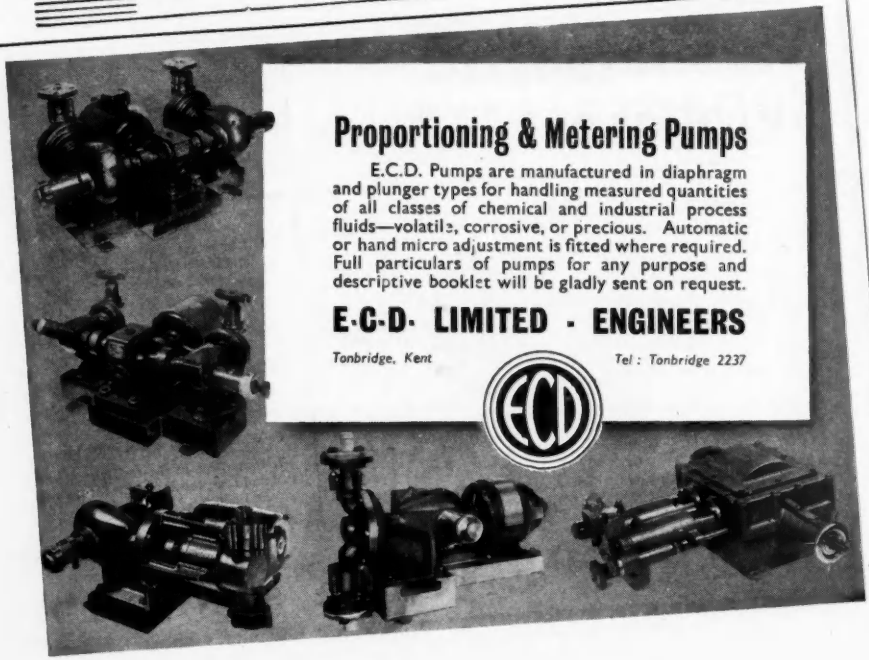
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INDEX TO ADVERTISERS IN THIS ISSUE

	Page
Blackwell's Metallurgical Works, Ltd.	x
Bowmans Chemicals, Ltd.	xv
Boydell, E., & Co., Ltd.	x
British Acheson Electrodes, Ltd.	iv
British Tar Products, Ltd.	xiv
Brough, E. A., & Co., Ltd.	iii
Classified Advertisements	xvi, xvii & xviii
Cruickshank, R., Ltd.	Cover ii
E.C.D., Ltd.	ii
Essex Aero, Ltd.	ix
Feltham, Walter H., & Son, Ltd.	xv
Fielding, T. H., & Sons, Ltd.	xv
Gallenkamp, A., & Co., Ltd.	xii
Girling, S., & Sons (Coopers), Ltd.	xviii
Harris, Francis W., & Co., Ltd.	xviii
Haughton's Metallic Co., Ltd.	xviii
Haworth, F. (A.R.C.), Ltd.	xiv
Imperial Smelting Corp. (Sales), Ltd.	ii
Kent, James, Ltd.	Cover iii
Kestner Evaporator & Engineering Co., Ltd.	vi
Key Engineering Co., Ltd. (The)	Cover ii
Leigh & Sons Metal Works	xv
Leeds & Bradford Boiler Co., Ltd.	xv
Lennox Foundry Co., Ltd.	xviii
Manesty Machines, Ltd.	viii
Metropolitan-Vickers Electrical Co., Ltd.	Cover iv
Newton Chambers & Co., Ltd.	xiii
Norman Engineering Co.	i
Oliver Pell Control, Ltd.	Cover iii
Orr, George, W., & Co., Ltd.	Cover ii
Paget, R. F.	xvii
Perry & Hope, Ltd.	xv
Robinson Brothers, Ltd.	Cover ii
Robinson, L., & Co. (Gillingham), Ltd.	viii
Shawinigan, Ltd.	x
Shell Chemicals, Ltd.	vii
Simon, Richard, & Sons, Ltd.	vi
Somerville & Morrison, Ltd.	Cover iv
Spence, Peter, & Sons, Ltd.	i
Spencer Chapman & Messel, Ltd.	Front Cover
Thermal Syndicate, Ltd. (The)	xi
Tretol, Ltd.	Cover iii
Trevis Smith, Thos., Ltd.	x
Ward, Thos. W., Ltd.	v
Wilkinson, James, & Son, Ltd.	iv
Wolters Balances, Ltd.	xv

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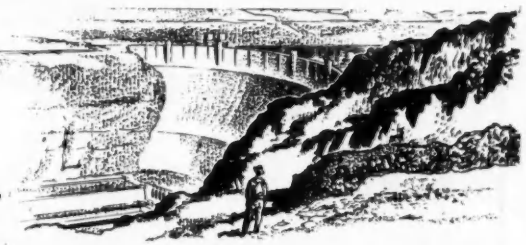

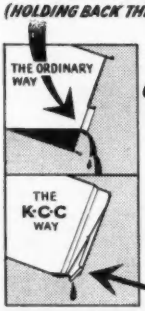

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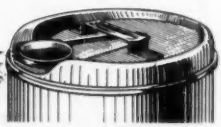

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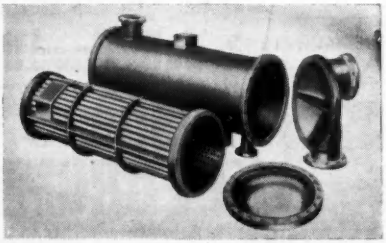

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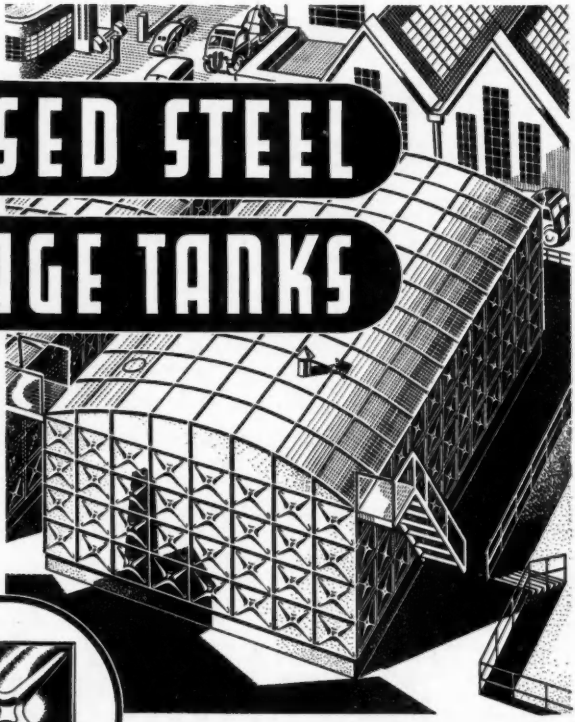

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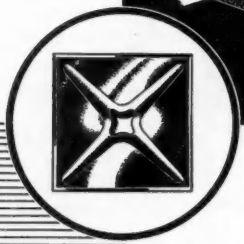

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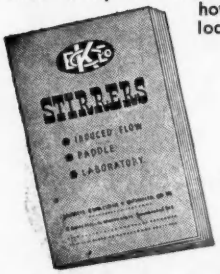

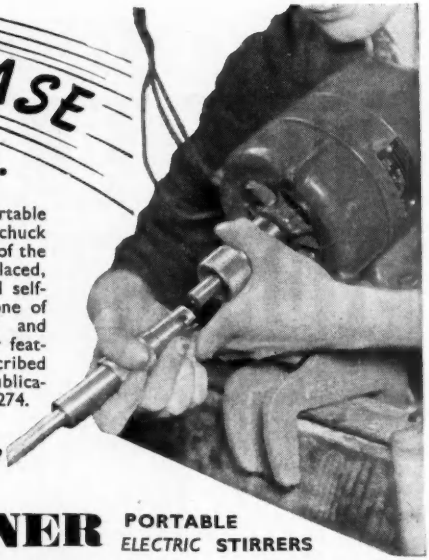

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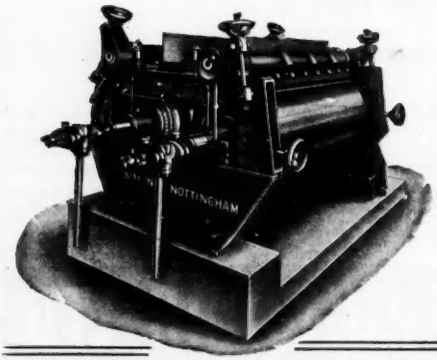

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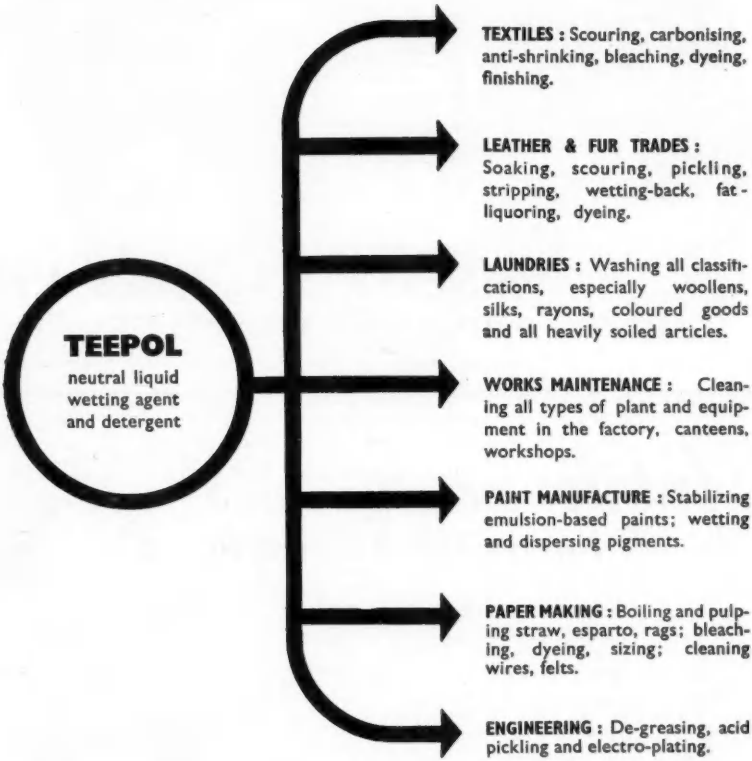
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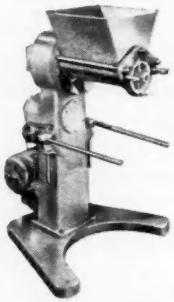

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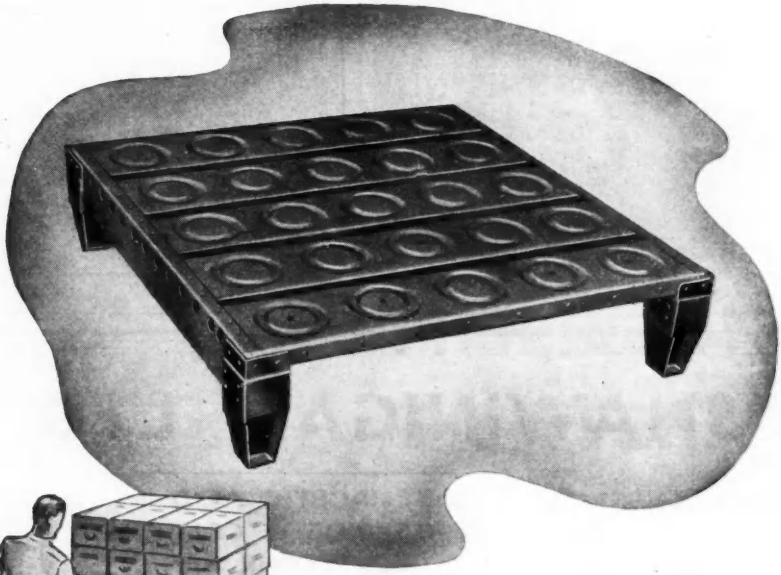

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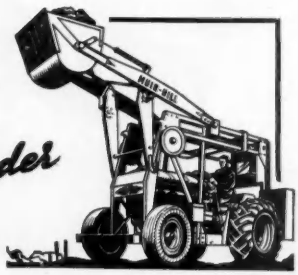

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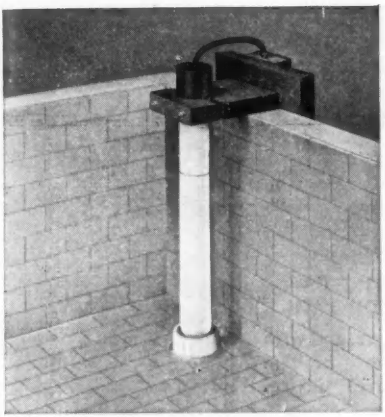

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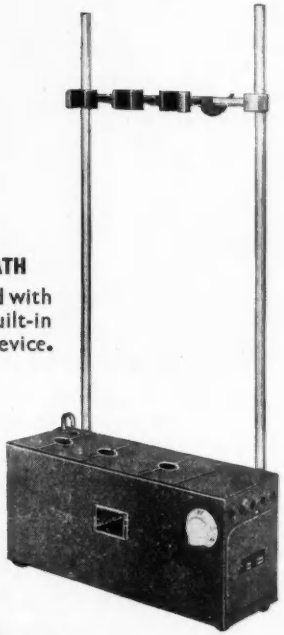

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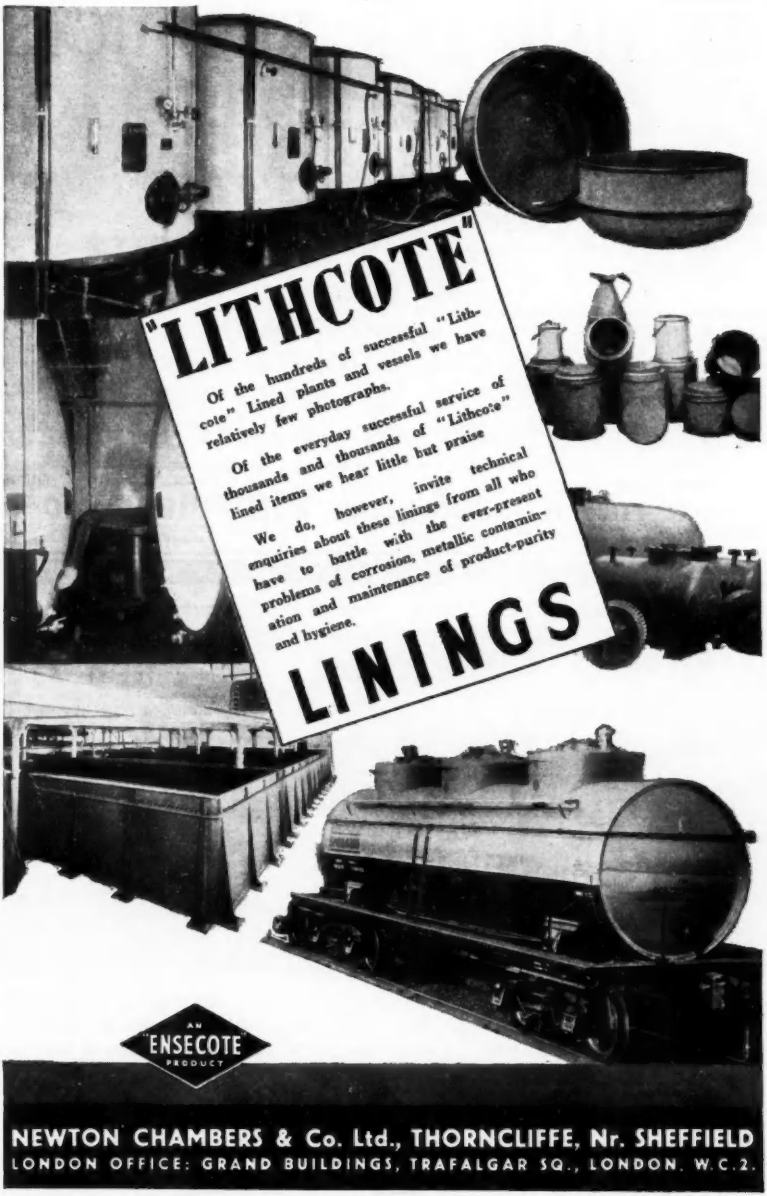
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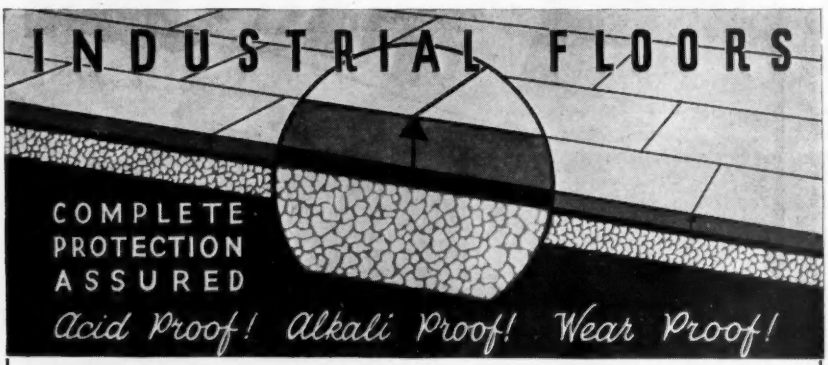

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The
Chemical Age

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A Chemical Progress Report

IN broad terms a great deal has been said and written about the post-war expansion of chemical industry. The recently published annual report on the Progress of Applied Chemistry (Society of Chemical Industry) provides detailed and panoramic evidence. Admittedly it covers a year that already seems politically and economically distant, 1948; but even this time-gap cannot reduce the instant impression of size and variety, of quantity and quality, which is given by this 742-page volume. The vastness of the chemical industry, the utter impossibility for any one man to achieve an intimacy with more than one or two branches of it, the extension of chemical ideas into fields that many would not think chemical at all, these are impressions that follow inevitably from a random scanning of the 30 main sections. Nor is the total picture static. It is a film rather than a photograph album. Few of the developments reported are completed tasks: almost all the journeys that chemists are making are much nearer their beginnings than their endings.

It would not be logical to argue that 1948 was a year of exceptional activity merely because this survey is bigger than similar surveys for other years. One plain and simple fact is that the Society of Chemical Industry received a better allocation of paper and was therefore able to offer more space to its reporters. 1948 is more accurately assessed as the first year of this century's forties which the society has been able to survey with adequacy; although, in saying this, it is not doubted that more than a few of the reporters themselves will disagree sharply, for there is plenty of evidence to show that they still have to leave out as much as they manage to include. However, it is not suggested that these annual reports should ever be exhaustively complete. Within sensible limits it is a good thing that the specialist reporter should feel some sense of restriction. The dangers of selectivity are less than the dangers of repletion and incomprehensibility. The opening sentences from the section on insecticides may well be quoted: "For this report certain topics have been selected from among the great number available. The topics selected appear either to be applications of general interest or work of fundamental importance."

So long as expansion continues, there is surely no better policy for any attempt to survey progress in a branch

On Other Pages

Leader:
A Chemical Progress Report . . 897
Notes and Comments:
Dollars and Chemicals . . 899
Accident Review . . 899
Risks and Penalties . . 899
France's Coal . . 900
Dispersing I.G. Farben . . 901
Petroleum and Copper . . 901
Glass Enterprise in Jugoslavia . . 901
China's Magnetite Ilmenite . . 901
Chemical Exports Fell in November 902
Accidents with Gas and Chemicals 903
Two-Stage Plan at Grangemouth . . 904
Fractionating Column Products . . 905
Chemical Processing Costs . . 905
Degrees and Associateship . . 906
Liverpool Chemists and Metallurgists 906
£24,000 for Post-Graduate Work . . 906
Cement Industry's Case . . 906
Fusion-Welded Pressure Vessels . . 907
Unsolved Problems of Heat Transfer 908
High Valency Cobalt . . 909
The Widening Field of Tall Oil . . 910
Alcohol from Cassava . . 912
The Chemistry of Fur Dyeing . . 918
Indian Chemicals and Fertilisers . . 918
Protection for India's Aluminium . . 920
Prices of British Chemical Products 924
Taxation Reliefs in Industry . . 928
Another U.S. Synthetic Fibre . . 928

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of knowledge. Again one may usefully quote from Professor Pollard's introduction to the agricultural section: "Space restrictions and the irregular, though improving, flow of scientific literature, in themselves prevent justice being done to more than a limited number of topics. In dealing with these, too, reference has perforce been made to communications appearing, in some cases, several years before that period strictly under review. Only in this way can current research be placed in its true perspective."

For the reader who wants to know "how things are going" in this or that branch of applied chemistry these principles are sound and practical. In the coldest sense, of course, science must shun the human element, and a selective method of reporting brings in that potential source of bias. But how much more indigestible is the alternative, a monotonous procession of over-brief descriptions of all relevant communications, the important and the trivial alike! The reader who desires this fullsome diet must relv instead upon the regularly published abstracts, and he has, after all, several series from which to choose.

Brevity has long been the soul of wit, and one must recognise that henceforward in the sciences selectivity is the soul of comprehension. A recent report on scientific man-power assumed that scientists had a working life of approximately 30 years. This figure may have been a weighted average to some extent, but it is fair enough as a rough assumption. How much of the entire picture, even in his own field, can a man hope to keep in focus and perspective during 30 years? One must allow the annual reporters to be guides and leaders, and discourage them from feeling guilty or apologetic for not being able to act as cataloguers.

A development that seems most praiseworthy, and which minimises the dangers of bias in selective reporting, is the writing of sectional reports by groups of specialists. Thus, the section on agriculture and horticulture has been prepared by the society's agricultural group with sub-sections on soils, fertilisers, crops, horticulture, the application of insecticides and fungicides, the control of nematodes, analysis of materials, animal nutrition, and veterinary medicines, each entrusted to different specialists. Similarly the section on resins, drying oils, varnishes, and paints has been

(continued on page 900)

Notes and Comments

Dollars and Chemicals

EXPORT and import accounts, of which the November totals have just been rendered by the Board of Trade, preserve a peculiar interest as portents of the ultimate results of a direct kind of the devaluation policy. Most of the evidence, however, fails to present any very clear picture of drastic changes in the channels of trade. United Kingdom purchases of chemicals of all kinds in November (£2.064 million) and sales (£6.893 million) do not represent very marked departures from the October level, and the record of exchanges with the U.S.A. is not greatly revealing, although the November aggregates show that exports to the U.S.A. were doubled in value (£266,671), while imports (£564,351) were about £90,000 less than in November, 1948. The cost of maintaining supplies of some essential American materials is typified by the figures for carbon black, 72,025 cwt. of which required £302,428 in November, while a year ago 86,760 cwt. was purchased for £245,329. Borax, on the other hand, is shown to have cost proportionally no more in November than it did 12 months before. That single piece of evidence, however, is certainly no assurance that the import value of this and possibly several other chemicals of American origin has not changed substantially since them.

Accident Review

SEEKING to isolate a source common to most industrial accidents is an unrewarding task. How many and various are the routes by which industrial mishap, injury and sometimes disaster can be created in works using or processing some chemical substances and molten metals is made very clear in the current report of the Chief Inspector of Factories. The fact that the year dealt with is 1948 does not in any way invalidate the salutary effect of the warning note. Although comparative figures of accident occurrences convey no accurate picture between one year and another, it is clear that 1948 was far from being a black year in the accident records and that managements as a whole have been leaders in promoting measures to minimise risks. A good deal more could have been done if authority to rebuild could be more readily obtained. Although there is no common factor, it is clear that most of the accidents, particularly with compressed gases, were rendered more or less inevitable by sudden unforeseeable lapses of workers. The inadvertent substitution of an acetylene or oxygen cylinder, when the intention was to provide an inert atmosphere of nitrogen gas, will always be potentially a short cut to serious trouble. That, however, is the sort of thing which is always capable of occurring, and does. To prevent it, managements will need to tackle a thing much more intractable than bricks and mortar—the human capacity to drift into slovenliness and absent mindedness, when long uneventful operation has put caution to sleep.

Risks and Penalties

THE picture the report presents tends to be confused by the classification of some groups of widely separated industrial activities under the heading of "hot and corrosive substances"—they were responsible for 8038 accidents last year, 315 fewer than in 1947, and only 1843 were attributed to corrosive chemicals. Passages in this report clearly suggest that the trouble experienced with corrosive substances could be minimised by two factors: the wider adoption of the safer new mechanical systems for decanting, transport, etc., and the more frequent substitution of innocuous materials which, it is suggested, might serve some processes as well as concentrated acid or alkali. Apart from this, there is no suggestion in the national survey of accident causes that managements have been neglectful, although there is

thought to be further scope for the employment of foolproof systems of sampling, temperature reading, etc. In 1948, as in every year, the need to inculcate "safety mindedness" in workpeople and actively prevent, by propaganda and penalties if necessary, the unthinking improvisations which often end disastrously is driven home with undiminished force. Readiness to take some risks is one of those enduring and attractive human attributes for which, however, there is no room in modern chemical processes.

France's Coal

LES Charbonnages de France, the French equivalent of the British National Coal Board, has recently published—very belatedly—its provisional report for the year 1948. However, as a sort of apology perhaps for the tardiness of its arrival, the report includes production figures for the first nine months of 1949, which bear favourable comparison with 1929 on quantity alone, in addition to which one has to take into the reckoning the fact that in the latter year there were some 209,000 workers with no paid holidays, against the considerably less number of 190,500 in September 1949 with some paid-for holidays. France's coal production—never approaching anything like adequacy for her domestic requirements—amounted to 39.5 million tons (equivalent to an annual rate of 54 million tons) in the January to September period this year, which very nearly approaches her peak output of 55 million tons reached in 1929. The promising production figures are interesting, bearing in mind that France's coal mining operations are almost entirely nationalised; Les Charbonnages de France accounted for a total production of 43,560,000 tons in 1948 out of the country's aggregate output of 45,130,000 tons. Productivity per miner in 1948 increased by 17 per cent, which compares with a very fluctuating position in this country as regards output per man. There was also a notable decrease in absenteeism, from an average of 30.27 per cent in 1948 to 13.77 per cent in September 1949. It seems that France will always need a considerable import of coal to satisfy her domestic needs, but she appears to be doing something herself towards an improvement in the general situation. In this connection it is noteworthy that Britain exported to France in the first nine months of this year 1,093,772 tons of coal, and by November's addition this figure was increased to 1,378,834 tons.

A CHEMICAL PROGRESS REPORT

(*continued from page 898*)

produced by specialists from the Oil and Colour Chemists' Association; and plastics is a subject dealt with by the society's plastics group.

In these sections readers will certainly find some degree of overlapping between the sub-sections, but this a wholesome safeguard against the risk of bias and selectivity. Some other sections, quite as broad as those which groups have covered, have been compiled by one writer only. However authoritative an individual may be, the group method will continue to be preferable, and one would like to see this technique used much more often in future annual reports of the Society of Chemical Industry. It is an innovation most admirably suited to our times. Moreover, it spreads the load, for there can be little doubt that the preparation of this kind of report is a labour of professional love, and there are few scientists today who are not overworked.

There is reason to believe that the annual report for 1949, already being written while the 1948 volume is just being digested, will be enlarged again. Members of scientific societies are well aware of the rising costs of publications, but they can certainly take comfort in the realisation that the quality of publications is also rising.

DISPERSING I.G. FARBEN

Three Zonal Units?

THE decision, made originally by the old quadripartite control in Germany, to break up I.G. Farben is to be enforced by legislation which will be set up early in 1950 by the Allied High Commission. This was revealed by Mr. John McCloy, U.S. High Commissioner, at a Press conference in Frankfurt last week.

Since existing legislation on that subject was on the bipartite level, it would have to be harmonised with the French laws, said Mr. McCloy. The Allies were firm in their intention to eliminate all concentrations of economic power, but they "would not be unmindful of the claims of creditors and shareholders as far as that was compatible with this aim."

A memorandum had recently been submitted to the Federal Government by the "Protective Association of Security Holders," an organisation which claims to represent one-third of the shareholders of I.G. Farben. This asked for the early breaking up of the latter into three units —one in each zone—large enough for effective operations; the right of the old shareholders to exchange their shares against those of different companies; and the re-admission of I.G. Farben shares to the Stock Exchange.

According to an official of the bipartite I.G. Farben control office, states a report in *The Financial Times*, one of the obstacles in splitting up the trust would be the sales organisations abroad, which could only be dissolved if the Governments concerned co-operated.

China's Magnetite-Ilmenite

FOLLOWING three years of work, the Metallurgical Research Institute of the Enterprise Department of the North China People's Government has succeeded in extracting and refining locally occurring vanadium-bearing magnetite-ilmenite. The magnetite-ilmenite in the Tamiao and Heishan districts of Luanp'ing hsien, Jehol Province, is the only source yet discovered in China. The exploitation dates from the Japanese occupation of the territory in 1937. A plant was later built in Chinchow, especially for refining vanadium ore, but on the eve of V.J.-Day, Japanese engineers burned all the records of their technical research. Preliminary estimates place the deposits at about 2 million tons. The ore is estimated to contain 55 per cent iron, 14 per cent magnetite-ilmenite, and 0.3 per cent vanadium.

PETROLEUM AND COPPER

Dollar Aid in November

FOR the purchase of fuel, machinery, food and raw materials in the U.S.A. and dollar account countries, the United Kingdom and Western Europe received more dollars in Marshall aid in November ($240.5 million) than in any other month in 1949.

Among the major items for Britain in that month, for which Marshall aid was authorised, were: petroleum $32 million, copper $24.4 million, and machinery $22.9 million.

The announcement of these figures last week by the ECA Mission to the U.K. almost coincided with the Government's statement that, in view of Britain's dollar deficit, oil importers in 1950 will be required to absorb any available surplus in this country before drawing supplies from dollar sources.

Britain's share of Marshall aid, states the ECA Mission, comprised in November nearly half of the total of all countries participating in ERP. Purchase authorisations for the whole of Western Europe included petroleum products to the value of $56.6 million, non-ferrous metals and products $47.1 million, of which the major item was $24.4 million for copper and copper products for Britain.

Glass Enterprise in Jugoslavia

GLASS manufacture in Jugoslavia, revived and enlarged since the war, is likely to become one of the country's major industries.

Increased production, which has followed nationalisation, is reported in Jugoslavia to have been steadily maintained; by the end of 1951 output is expected to reach 50 million sq. ft. of flat glass and 50,000 tons of blown glass. Included among a number of new products are heat-resistant glass for laboratory purposes, lenses, glass wool, laminated glass, ampoules, glass tubes, vacuum flasks, electric bulbs, and glass jewellery.

A Federal Glass Institute was recently formed by the Government. Construction of a modern plant for the manufacture of blown glass is reported from Paracin in Serbia. On completion, this, it is claimed, will be the largest factory of its kind in the Balkans.

Next year the first automatic smelting furnaces will be put into operation at the new works and production greatly increased.

CHEMICAL EXPORTS FELL IN NOVEMBER

Less than the October and 1948 Totals

CHEMICAL exports from Britain in November showed a decrease in value, both when compared with October and with the corresponding month last year. November's aggregate for all chemicals was **£6,893,694**, against **£6,961,717** in the same month of **1948** and **£7,640,808** in October this year. These totals include the official groupings of chemical manufactures; drugs, medicines and preparations; dyes and dyestuffs; and paints, pigments, colours and extenders. The total figure for value of "chemical manufactures" **(£3,964,734)** shows a decrease of **£418,443** compared with October, but a comparatively small increase **(£327,280)** compared with November, **1948**. Practically half this last figure is accounted for by an increase of **£156,302** in ammonium sulphate exports in November compared with the same month of **1948**. Copper sulphate showed an increase of **£40,237**. There were, of course, trends in the other direction. For example, the figure for ammonium nitrate exports in November was **£133,170**, **£102,025** less than in November, **1948**.

EXPORTS

	Nov. 1949	Nov. 1948
Formic acid	Cwt. 2,558	Cwt. 2,213
Salicylic acid and salicylates	lb. 286,444	lb. 272,341
Value of all other sorts of acid	£103,621	£88,725
Aluminium oxide	Tons 129	Tons 90
Sulphate of alumina	2,063	2,385
All other sorts of aluminium compounds	2,211	347
Ammonium sulphate	18,989	11,101
Ammonium nitrate	4,839	8,892
All other sorts of ammonium compounds	1,453	1,458
Bleaching powder	Cwt. 11,446	Cwt. 52,684
All other bleaching materials	10,243	8,795
Cresylic acid	Gal. 310,450	Gal. 187,713
Tar oil, creosote oil, anthracene oil, etc.	2,596,803	544,210
Value of all other sorts of tar oil	£64,954	£38,232
Collodion cotton	Cwt. 1,588	Cwt. 1,988
Copper sulphate	Tons 2,238	Tons 1,317
Disinfectants, insecticides, etc.	Cwt. 43,045	Cwt. 47,862
Fertilisers	Tons 2,533	Tons 1,184
Nickel salts	Cwt. 4,801	Cwt. 9,302
Lead acetate, litharge, red lead, etc.	5,435	10,863
Tetra-ethyl lead	Gal. 101,770	Gal. 151,781
Magnesium compounds	Tons 639	Tons 687
Methyl alcohol	Gal. 9,759	Gal. 10,084
Potassium compounds	Cwt. 6,799	Cwt. 9,236
Salt	Tons 22,105	Tons 17,935
Sodium carbonate	Cwt. 241,328	Cwt. 405,198
Caustic soda	219,589	153,910
Sodium silicate	17,790	21,843
Sodium sulphate	75,126	4,346
All other sodum compounds	103,611	72,767
Tin oxide	139	277
Zinc Oxide	Tons 1,457	Tons 1,054
Total value of chemical manufactures, excluding drugs and dyestuffs	£3,964,734	£3,637,454
Quinine and quinine salts	Oz. 130,647	Oz. 102,044
Acetyl-salicylic acid	lb. 195,830	lb. 125,730
Insulin	100 International units 556,361	100 International units 596,908
Penicillin	Mega units 591,892	Mega units 526,544
Total value of drugs, medicines and preparations	£1,250,237	£1,394,818
Total value of dyes and dyestuffs	£627,778	£791,398
Plastic materials	Cwt. 37,736	Cwt. 33,822
Value	£452,645	£414,227
Chemical glassware	Cwt. 1,085	Cwt. 1,094
Value	£49,759	£43,186
Fans	Cwt. 4,572	Tons 204
Value	£132,814	£136,901
Furnace plant	Cwt. 7,019	Tons 437
Value	£75,975	£76,510
Gas and chemical machinery	Cwt. 33,966	Tons 1,134
Value	£418,364	£272,615

IMPORTS

	Nov. 1949	Nov. 1948
Acetic acid	Cwt. —	Cwt. 11,528
Boric acid	4,000	—
All other sorts of acid	3,994	4,565
Borax	22,804	1,000
Calcium carbide	20	7,480
Coal tar products (excluding benzol and cresylic acid)	—	5,806
Cobalt oxides	266	818
Arsenic	Tons 800	Tons 735
Fertilisers	1,000	8,352
Iodine	lb. —	lb. 132,255
Potassium chloride	Cwt. 738,572	Cwt. 711,401
Potassium sulphate	44,500	14,040
All other potassium compounds	1,626	5,134
Sodium nitrate	120,000	59,820
All other sodium compounds	5,799	4,354
Carbon blacks (from natural gas)	72,225	86,760
Total value of chemicals, drugs, dyes and colours	£2,064,169	£2,175,455

ACCIDENTS WITH GASES AND CHEMICALS

Factory Inspector's Casebook for 1948

THE complexity of the task of reducing the annual toll of industrial accidents arising from the use of chemical materials, gases and metals is amply allustrated in the current annual report (for 1948) of the Chief Inspector of Factories.

Because of the diversity of the fields with which the chief inspector's department is concerned, no broad general causes can be indicated, although it is clear that workers' forgetfulness of the destructive possibilities of some common materials, such as oxygen and acetylene gases, acids and alkalis, leading to misuse, continued to be a fruitful source of trouble. The inability in present conditions to rebuild plants to conform with the newer precautions which have been framed in the light of long experience also discounts to some extent the good principles of which nearly all industries approve.

For the purposes of the report accidents due to hot and corrosive substances are reviewed together, and it is shown that they were collectively responsible for 8038 mishaps, of which 12 were fatal. (In 1947 there were 8353 and 12 fatalities.) Corrosive chemicals were responsible for 1843 accidents, molten metal for 1971 and hot liquids, steam and hot metal accounted for the other 4224.

It was observed that most accidents in these categories in manufacturing processes were due to splashes, and it is urged that such plant should whenever possible be totally enclosed and that one of the new and versatile recording equipments should obviate the need for inserting dipsticks, thermometers, etc. Among the principal causes of accidents in the metal industries were iron foundries, 1005; miscellaneous non-ferrous alloys, 222; molten slags, 150; and molten aluminium, 144.

Corrosive Substances

The damage caused by corrosive substances was frequently associated with transferring them from one vessel to another, and here, too, it is urged that more use should be made of modern discharging apparatus employing closed piping, suitable transport and tipping devices and closed containers.

The view is expressed that corrosive acids and caustic soda are too freely used as cleaning agents, sometimes by people unfamiliar with their destructive properties. In many industries, it is suggested one of the synthetic detergents could be used in place of caustic soda.

Fires and explosives injured 1861 persons during 1948, the great majority (1425) having been attributable to explosions, which took 55 lives—more than twice the death roll in the previous year (24). Despite the immediate increase, the figures appear to reflect a considerably increased standard of preventive measures, when one recognises (as the report does) how greatly has the use of inflammable materials increased, through the expansion of the chemical, plastics and rayon industries, and of solvents, since 1938, when 26 lives were lost.

Fire and Explosion

The most comprehensive picture of the relative dangers of fire or explosion, as reflected by experience in 1948, associated with three main sources of combustion is provided in tables relating to inflammable gases, inflammable liquids, and inflammable and explosive solids and dusts. They show, in summary, that the numbers of accidents or "dangerous occurrences" were these:—

GASES: Acetylene, 119; oxygen, 29; propane, 5; hydrogen, 10; ammonia, 4; other gases, 7; gases containing carbon monoxide, 238. (Total 412.)

LIQUIDS: Fuel and heavy oils, 98; paraffin, 46; petrol, 100; methylated spirit, 18; tar, 11; paints and varnishes, 15; miscellaneous, 140. (Nine others were individually responsible for fewer than 10 accidents. Total 478).

SOLIDS AND DUSTS: Dust explosion, 23; scheduled explosives, 27; miscellaneous, 139. (Total 484).

The continuance of a comparatively high rate of accidents associated with acetylene and, rather less frequently, with oxygen receives some comment in this report. In a review of a number of typical incidents the danger of backfires during the use of dissolved acetylene cylinders is stressed and it is suggested that effective non-return valves, possibly with flame arrestors, should be integral parts of blowpipes.

It is recognised that a very large proportion of these accidents with gases under pressure were due to operators'

carelessness. Common forms of this have been the use of the wrong cylinder and failure to appreciate the great increase in combustion risks when the atmosphere is laden with added oxygen. Several incidents are cited of workers' clothing burning fiercely on coming into contact with a spark. Welding torches and cigarettes were fruitful sources of such trouble, when oxygen had been misused or permitted to escape.

The report notes that safety valves on gas equipment are not invariably vented outside the works and recommends that the precaution should be general. More than one instance is cited of accidents due to the indiscriminate release of gas through a safety valve.

Attention is drawn to some failures to recognise that ammonia gas can form with air a mixture which will explode if it is ignited. Four accidents in works, connected with repairs to refrigerating equipment, are associated with ignorance of that fact.

The worst disaster with inflammable liquids—when 12 were killed and 29 injured in Hull—underlined the well recognised hazards associated with petrol and, in this report, calls forth a strong recommendation that dams to prevent the flow should be employed in any places where such inflammable liquids are capable of escaping in bulk. One of the commonest sources of trouble has been the application of heat, for repair or dismantling of vessels before completely effective steps have been taken to steam out all traces of the inflammable liquids they contained. There were 25 explosions of this kind; four people were killed and 35 injured.

A summary of causation by corrosive liquids shows that the most common individual causes of accident were caustic soda (297), sulphuric acid (139), and hydrofluoric acid (68).

The accident rate associated with inflammable liquids, the report acknowledges, would no doubt have been much higher but for the voluntary acceptance by the large users of safe codes of practice recommended by the safety organisation of the Association of British Chemical Manufacturers and the British Chemical Plant Manufacturers' Association.

Dust explosions, which continue to form the subject of detailed research by the Factory Department at Buxton, are dealt with at some length. The prime factors among preventive measures are the provision of strong enclosures to isolate the flash, with simple explosion reliefs. Their application, it is recognised, is not practicable in flimsy buildings and cannot generally be done without some constructional work.

Two-Stage Petroleum Chemicals Plan at Grangemouth

WORK on the expansion of oil refining capacity at Grangemouth and the construction of a chemicals plant, though not yet greatly advanced, is reported to be proceeding at increased speed. (THE CHEMICAL AGE, *61*, 778).

The expansion will be effected in two stages, the first of which is to be completed by the end of 1950. In stage 1 it is proposed to install a modern pipe still distillation unit, with gas stabilising equipment as well as a complete range of treating plants for refining the various fractions. The new capacity will be 1.5 million tons p.a.

Building adjacent to the refinery project is the new factory of British Petroleum Chemicals, Ltd., which will use the feed stock supplied by the refinery.

Included in stage 1 is a new steam boiler and power plant of an installed capacity of nearly 20,000 kW. This plant, together with water pumping, cooling and compressed air equipment, will be between the two new factories. The power and steam requirements of both factories will be supplied from there, when the installation is completed next year.

Stage 2, to be completed by mid-1952, will provide for the production of premium grade spirits and special products. It will include one of the most modern catalytic cracking units with a vacuum distillation unit to prepare its feed stock, and a catalytic polymerisation plant to produce a stable spirit from its exhaust gases. Treating plant will handle the products from the catalytic cracker, and there will be some distillation and treating capacity for white spirit and other special product manufacture.

Two new jetties, additional storage tanks, despatching lines and pumps, and larger road and rail car filling sheds are included in the plan to meet the increased inward and outward volume of oil traffic.

To accommodate the administrative and chemical staffs, a new office and laboratory will be erected. Provision is being made for additional housing for the increased number of employees required for the refinery and chemical factory.

FRACTIONATING COLUMN PRODUCTS

*Estimating Composition Under Various Reflux Conditions**

THE composition of the products of multicomponent fractional distillation may be specified by fixing the ratio of the two named key components. An estimate of the distribution of the other unspecified components in the product streams, though uncertain, is required as a basis for the calculation of plate-to-plate compositions.

In a graphical interpretation of the application of the Underwood method to three component systems, the invariant region and product compositions under minimum reflux ratios were examined and illustrated by diagrams.

Good separations of the key components were obtained when zero proportions of components heavier than the heavy key in the top product and lighter than the light key in the bottom product were present. Reductions of the ratios of the key components below critical values allowed the unspecified components to occur successively in the products.

Components

The distribution of a single distributed component between two key components, when the reflux ratio varied and when all the components differed only slightly in relative volatility, was given. The theoretical basis of the Jenny type of diagram, under minimum reflux conditions, was presented and this diagram was used to illustrate the significance of the invariant compositions.

Under partial or total reflux conditions, all components of the feed occurred in each of the column products, although the concentration of the unspecified components might be extremely small if the ratio of the key components was high. Under total reflux conditions, the distribution of these unspecified components could be determined by successive approximations, using the Fenske-Underwood equation. A similar technique could be employed under partial reflux conditions, using the Underwood method.

To carry out this calculation, a criterion for the location of the feed was formulated. The assumption, that the optimum feed plate is that plate on which the ratio of the key components is similar to that of the feed liquid, was shown to be incorrect, but a recent empirical correlation due to Scheibel and Montrose was reasonably accurate for the system considered.

The distributions of the unspecified components between two key components in a three-component system for various reflux ratios, and for ratios of key components, were examined. The proportion of the unspecified components in the product increased to a maximum value with decreasing reflux ratio and decreased as minimum reflux was approached.

The relative variation in the proportion of the unspecified component with change in the reflux ratio was most marked in the case of sharp separations, when the absolute quantity of this component in the product was small.

The influence of errors in the preliminary estimate of product composition upon the calculated numbers of theoretical plates was considered under all reflux ratios. For practical purposes, the distribution of the unspecified components under total reflux conditions, which is readily computed, formed a suitable basis for an estimate of the distribution under partial reflux conditions. This estimate would usually incorporate a slight factor of safety in the design project, as it gives rather more theoretical plates than are required.

* "The Composition of Fractionating Column Products under Various Reflux Conditions," by J. S. Forsyth and N. L. Franklin, in a paper presented this month to the North-Western Branch of the Institution of Chemical Engineers, Manchester, of which the above is a summary.

Chemical Processing Costs

METHODS of estimating costs of operating many types of chemical processes and plants are contained in a report just issued by the U.S. Bureau of Mines. Factors suggested for consideration include: number and type of products to be manufactured; normal operating plant and capacity and location; maintenance requirements; availability of raw materials; personnel needed; expected annual working schedule and evaluation of capital assets. A free copy of the publication, "Guide for Making Cost Estimates for Chemical-type Operations" (Report of Investigations No. 4534), may be obtained from the Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pennsylvania.

CHEMISTS' QUALIFICATIONS

Comparative Values Discussed

IT was difficult to say what were the relative merit of the B.Sc. degree and the Associateship of the Royal Institute of Chemistry, claimed Prof. H. V. A. Briscoe, speaking at the recent general meeting of the London and South Eastern Counties Section of the Royal Institute of Chemistry.

The B.Sc. degree, he said, had, of course, a wider recognition by the public, it was given irrespective of nationality and its attainment brought the possibility of proceeding to a higher degree.

The requirements for the A.R.I.C. were more elastic, since the institute was not rigidly bound to a narrow form of regulation. From A.R.I.C. one could advance to the F.R.I.C., which connoted a higher standard of competence than did the Ph.D.

As regards comparative standards, Prof. Briscoe admitted that examination papers were not a reliable guide and, there the individual assessment was a point in favour of the institute. As an examiner for both qualifications, he thought that the standards were equivalent but not identical. The degree was more theoretical; the A.R.I.C. required practical competence. For part-time students there was a slight bias in favour of the A.R.I.C.

More Chemists and Metallurgists

A CONSIDERABLE increase in full-time work, leading to the Associateship and Fellowship of the RIC, was reported by the chemistry department of Liverpool Technical College, according to the principal, Mr. Raymond R. Butler, in a statement last week. In addition to post-advanced work in organic chemistry and chemical engineering, he said, there were special courses for local industries.

Metallurgy was being developed as an ancillary subject for mechanical engineering courses; welding activities had increased, with an expansion of the use of the cine-film to explain technique.

The college, said Mr. Butler, was acknowledged to be the Merseyside centre for advanced technological studies. There were now 6391 students compared with 3222 when he became principal in 1934. Overcrowding and small laboratories were the main problems, and obtaining highly-qualified staff under salary limitations was extremely hard.

CEMENT INDUSTRY'S CASE

Probable Effects of Nationalisation

THE case against nationalisation of the cement industry was forcibly stated by Lord Selborne, chairman of the Cement Makers' Federation, at a Press conference in Manchester last week.

Replying to the charge that the industry was a monopoly, Lord Selborne stated that the federation represented about 20 companies, nine of which are independent groups, while the rest are linked together. It was, he asserted, a contented industry employing about 16,000 people with an average wage of £9 to £10 a week, and it had never known a major strike. It had worked out its own system of profit sharing.

Under State control, cement costs would inevitably rise through inefficient management. The industry would be placed in the hands of people who were not experts.

New records for export deliveries for the first seven months of this year were announced by the chairman. The figure of 1,696,968 tons had already been exceeded by 70,768 tons, while home market deliveries, with a total of 6,755,253 tons, were only slightly below the 1948 total of 6,893,000 tons.

$24,000 For Post-Graduate Work

THE award of 76 post-graduate and post-doctoral fellowships to 47 American universities for the 1950-51 academic year, involving the expenditure of $224,000, has been announced by the E. I. Du Pont de Nemours & Co., Inc. The gift perpetuates the company's plan, originated in 1918, to encourage graduate research in chemistry. It now includes physics, metallurgy, and engineering and provides support for the advanced training of students in these branches of science.

Of the 70 post-graduate fellowships, 45 are in chemistry, 15 in chemical engineering, five in mechanical engineering, three in physics, and two in metallurgy. The six fellowships are in chemistry.

First International Microchemical Congress

The Austrian Society of Microchemistry is issuing invitations to the 1st International Microchemical Congress, which will be held in Graz from July 2-6, 1950. The main purpose of this meeting is to assemble the microchemists of all countries for mutual discussions and exchange of ideas. The whole field of microchemistry will be covered.

FUSION-WELDED PRESSURE VESSELS

New Standards of Construction and Testing

THE need of chemical and other industries of a comprehensive code, of the kind employed in some other countries, relating to the construction and testing of pressure vessels has been recognised by the issue of a new standard by the British Standards Institution. This is B.S. 1500, "Fusion Welded Pressure Vessels for Use in the Chemical and Allied Industries."

Representing the first stage in a continuing programme, the code covers fusion constructed welded pressure vessels of steel and steel alloys for the chemical and allied industries. Provision has been made for the inclusion of requirements for non-ferrous vessels at a subsequent date. It is also proposed in due course to prepare similar codes to cover forged vessels and other methods of construction, such as riveting, brazing, etc.

In dealing with special activities and requirements for pressure vessels of the petroleum branch of the chemical industry, full consideration has been given not only to British practice, but also to the experience of the American petroleum industry, and acknowledgment is made to the American Petroleum Institute and American Society of Mechanical Engineers (API-ASME) code.

In the British Standard code, vessels are graded according to the severity of the duty or danger, and inspection and tests of increasing stringency have been applied as the duty becomes more severe. It includes seven sections, the first of which covers the design, construction, inspection and repair of vessels in the wide field of the chemical and allied industries. Other sections deal exhaustively with such important matters as the range of materials covered and their stress values, corrosion factors, joint efficiency, tolerances, protective devices, inspection according to the duty of the vessel, testing and acceptance.

In connection with the last, the code lays it down that the manufacturer should submit for approval by the inspecting authority before commencing manufacture, a sectional drawing showing the pressure portions of the vessel and carrying the following information, in addition to the dimensions, dealing with the strength of the vessel:—Class of material; thickness of plates; method of welding; large scale dimensional sketches of the weld grooves for the longitudinal and circumferential seams and details of the joints for branch pipes, seatings, etc., and the position of these joints relative to the seams and other openings; working pressure and proposed test pressure; the extent and location of corrosion allowance.

There is an important section on suggested methods of stress relief, including heat treatment and mechanical peening. Requirements for access and inspection openings of all vessels subject to corrosion, abrasion or erosion, are given.

Copies of this standard, being distributed by the British Standards Institution, cost 25s. post paid.

American Codes for Testing Techniques

A PROPOSED testing code for sensible heat transfer in shell-and-tube equipment was among the subjects discussed at the Pittsburgh meeting of the American Institute of Chemical Engineers.

The code, which is the first in a series governing testing and equipment performance standards for chemical process equipment, is now awaiting the approval of users and manufacturers.

Reports have already been made by a number of groups, including oil companies, through the American Petroleum Institute and with the American Institute of Mechanical Engineers.

The main object of the code is to facilitate tests of heat transfer equipment for comparison with the manufacturer's predicted performance. An additional purpose is to secure reliable full-scale test data.

The code may also be applied to heaters of shell-and-tube construction where saturated steam above atmospheric pressure is the heating medium, and where the heat is absorbed as sensible heat.

The performance of absorption towers has been the subject studied by another sub-committee which is drafting a code expected to be ready in about a year.

Another sub-committee is dealing with the characteristics of dryers.

UNSOLVED PROBLEMS OF HEAT TRANSFER

U.S. Views on Direction of Future Research

THE existence of wide gaps in some of the fundamental aspects of heat transfer, calling for a variety of measurements, for some of which there are no readily applicable methods, was pointed out at a meeting this month of the American Institute of Chemical Engineers.

These points were raised at the 42nd annual meeting of the institute in Pittsburgh, by Dr. William H. McAdams, professor of chemical engineering at Massachusetts Institute of Technology. Dr. McAdams observed that the mechanism of conduction on homogeneous solids systems is well established, and a number of problems have been solved recently by analytical methods. New and better methods were required, however, to answer the problems of conduction.

Future experimental work should involve measurement of physical properties of present materials over wider ranges of conditions, and of new materials which will be developed. It would be necessary to devise methods of measuring thermal conductivities at temperatures up to 5000° F.

Combustion Effects

The transfer of heat by radiation between surfaces in transport media was now on a sound mathematical basis. In the combustion of fuels with preheated air in industrial furnaces at high temperatures, various chemical compounds of unknown radiating characteristics are formed. Because the flame temperature on which reaction rates and the nature of the products depend is controlled by heat transfer, further studies on such systems seemed imperative. Gas radiation data for steam and carbon dioxide were limited to low pressures, and the effect of high pressures should be determined. Fuels were now often burned with oxygen-enriched air, or oxygen instead of air.

With heat transfer from a solid to a fluid the situation was far more complex, both conduction and convection being involved; and heat transfer had a complicating effect on the mechanism of fluid flow which was not fully evaluated.

Various methods of attack include mathematical analogies between transport of heat and momentum, and of heat and mass. For many cases, where theory is inadequate, remarkable success has been attained in correlating data in terms of well chosen dimensionless groups of the pertinent factors, thus substantially reducing the number of variables. The greatest progress had been made in measuring and correlating local or point coefficients of heat transfer.

The field of conventional heat transfer contained a number of unsolved problems. For example, in the condensation of a vapour from a non-condensible gas, data were available only for steam and air at atmospheric pressure; there were no data for dehumidifying a mixture of various vapours and non-condensible gases. Promoters have been found to render certain metals non-wettable towards condensed steam; they permitted dropwise condensation which gives much higher coefficients of heat transfer than does film-type condensation.

Unconventional Media

Novel applications of heat transfer between surfaces and fluids involved both conventional and unconventional heat-transfer fluids, frequently with unusually high density of heat flux and high temperature level. Such conditions were beyond the range of existing empirical equations, and lack of fundamental data on velocity and temperature fields caused a good deal of uncertainty as to the reliability of theoretical relations.

Much remained to be done to collect data for the new conditions, including physical properties of many heat transfer media. Further work is required on forced convection at very high gas velocities.

Beet Sugar Waste Disposal

AN alternative method of treating the wastes from beet sugar refining was outlined by Dr. Clair N. Sawyer (Massachusetts Institute of Technology) at the recent 42nd annual meeting in Pittsburgh, Pa., of the American Institute of Chemical Engineers.

Chlorine is added to destroy the bacteria and simultaneously precipitate the undesirable organic compounds. Lime is then added to counteract the acidity of the chlorine treated water, so that the liquid is relatively harmless and may be emptied into any freshwater stream.

Disposal of wastes from petroleum refineries, coke plants, tanneries and breweries were among the wide variety of subjects covered.

HIGH VALENCY COBALT

Preliminary Results of Research at Padua

PRESENT knowledge on the oxides of chemical elements clearly shows that in many cases, as for instance iron, cobalt, nickel, copper, and bromine, the highest valency is still ill-defined or unknown. Some researches have lately been carried out by Prof. Ugo Croatto, of the University of Padua, to ascertain the highest valency obtainable with cobalt by oxidation with oxygen in the presence of oxide and peroxide of sodium. The substances employed were: CO_3O_4, Na_2O, Na_2O_2, O_2.

The researches were concerned with mixtures of oxide and peroxide of cobalt in the compounds $Na/CO = 2, 3, 4, 5, 6$. Heating temperature: 300-500°C. and pressure of oxygen 1 atmosphere. The reaction products were coloured an intense blue.

Tetravalent Cobalt

The conclusion reached by Prof. Croatto, is that by oxidation at various temperatures, with oxygen and oxide or peroxide of sodium, cobalt assumes a positive tetravalency. The anhydritic character of CO^{4+} is revealed in the formation of the *o*-oxycobaltate of sodium, Na_4CoO_4, unknown till now. It is a blue-coloured compound, alterable under the action of carbon dioxide and of water, without disengaging oxygen. With the acids on the contrary it disengages oxygen, producing salts of Co^{2+}.

This valency has been already pointed out on other cobalt compounds, but they were not always well defined or surely ascertained. Among them is observed the cobalt dioxidehydrate $CoO_2.H_2O$ and the cobalt compounds $MgO.CoO_2$, $BaO.CoO_2$, $BaO.2CoO_2$ and $K_2O.CoO.3CoO_2$. These salt compounds may be described as cobaltates, representing the highest form of oxidation attained.

Of the oxide Co_3O_4 there is a well-founded hypothesis that it is a salt oxide, pertaining to the oxides of the bi- and tetravalent cobalt, rather than to the bi- and trivalent cobalt. Perhaps even Co_3O_4 might be considered as a salt oxide between bi- and trivalent cobalt.

The co-ordination 4 in the *o*-cobaltate of sodium perfectly agrees with the dynamic considerations relating to the electrostatic attraction-repulsive influences among the various ions composing the complex anion $[CoO_4]^4$.

Calculation of the electrostatic factors in the building of a complex, contacting with a co-ordinating tetravalent ion a number n of ions O^{2-} that initially were infinitely distant, serves to reveal the highest development of energy—conditions of stability—when $n = 4$ with a tretrahedric arrangement, or when $n = 3$ with plane triangular arrangement, according as the radius of the co-ordinating ion is greater or smaller than 3.15Å. Because the ionic radius of Co^{4+} is doubtless greater than 3.15Å, Prof. Croatto concludes in favour of the co-ordinate 4 in the "*o*-oxycobaltates."

This co-ordinate had never yet been attained in the known compounds, with the exception of the salt oxide Co_3O_4.

Prof. Croatto has made a similar investigation in respect of iron. The substances employed were the same as those employed with cobalt, but the oxide and peroxide of cobalt were replaced with sesquioxide of iron. The researches were made with mixtures having the composition $Na/Fe = 2, 3, 4, 5, 6, 7$, heated to 300-450°C. in a medium of oxygen, at atmospheric pressure. The quantity of oxygen discharged under the action of water and sulphuric acid was measured; in the residuary solution the iron was reduced to bivalency and titrated by means of permanganate.

Positive Hexavalency

The conclusion reached by Prof. Croatto is that by oxidation at various temperatures with oxygen and oxide or peroxide of sodium, iron assumes positive hexavalency. The anhydritic character of Fe^{6+} is revealed in the formation of the *o*-oxyferrate of sodium (Na_6FeO_6).

This valency is already known for other alkaline or alkaline-earth ferrates, but in the "meta" form. Among them one of the most stable is K_2FeO_4. The co-ordination 6 in this form is remarkable, as it does not agree with the conventional view according to the calculation of the electrostatic work in the building of complexes.

Cellulose Plant for Morocco

A project for the construction of a cellulose factory is now taking shape in Morocco. Treatment capacity would be 30,000 tons a year, increasing to 100,000 tons. Output would necessarily depend upon wood production which is expected to reach 70,000 tons in 1960.

THE WIDENING FIELD OF TALL OIL

Many New Uses Foreshadowed in Patent Literature

From A SPECIAL CORRESPONDENT

PRIOR to 1939, tall oil, the brown oily resinous liquid, obtained as a by-product of the sulphite-paper process, was regarded merely as a cheap substitute for natural oils and fats. Research carried out during the last 10 years has not only made possible great improvements in the quality of the oil, but opened up uses for it in some 42 distinct industries.

Apart from the normal high grade crude tall oils produced by blending soap skimmings from various kraft paper mills, it is possible by solvent refining processes to manufacture a range of non-crystallising oils, many of them free from objectionable smelling mercaptans and possessing a very light or pale colour. As the colour stability at average temperature is of a high order, light coloured solvent refined tall oils can be used for the manufacture of detergents, glyceryl phthalate alkyds, soaps and similar products. Polymerised tall oils are now being manufactured for special purposes. These have a good odour but are dark in colour.

Vehicles and Emulsions

The resin acids are stabilised and non-crystallising and their sodium salts have excellent carrying powers for mineral oils. Products of this kind are used in wood oils, cutting oils, disinfectant sprays, weed killing preparations, etc.

Stable or semi-stable emulsions can be made from polymerised tall oils for use as flotation agents in mining industry. Partially hydrogenated tall oil with a titre of 52.8°C. is being used for the preparation of polishing compounds and for dressing and impregnating textile materials.

Tall oil was widely employed during the war as a substitute for resin and linseed oil in linoleum and surface coating compounds. A review of the uses found for tall oil in Germany was given in a FIAT final report (No. 1144, June 5, 1947). This deals mainly with the products made by Spangenberg Werke Hamburg-Eidelstandt, Germany. Methods are given for preparing a substitute for linseed oil, stand oil to be used in the paint industry; tall oil Beckosol, a cheap resin used for wire coating and for petrol tanks; and lumitol, to be used as a linseed oil substitute in enamels and varnishes.

Tall oil has indeed hundreds of uses in addition to those it serves in the coating industries. A Norwegian patent, 65,350, taken out in 1940, discloses a method of converting tall oil into an adhesive and impregnating agent for paper and bond. The acids in the oil are neutralised by heating it with a suspension of lime in water; the excess calcium hydroxide acting as a filler. Most of the water is then evaporated and the resulting product is heated for 15 minutes at a temperature of 130-140°C.

An American patent, 2,424,047 (1947), gives details of the manufacture of an adhesive compound made by esterification of tall oil with polyhydric alcohols. Direct esterification of the alcohol with the acid, with or without solvent, is one method of producing this kind of compound; the acid exchange between tall oil and a polymer of an allyl-type ester is another. The tall oil ester resins made in this way are claimed to be of interest as general adhesives and interlayers for laminated articles; as self-sustaining films, and for sizing and impregnating cloth, felt or paper.

A Swedish patent, taken out over 20 year ago (53,028, May 1919), gives a method of making a tall oil adhesive by mixing 92 parts of asphalt, 5 parts of tall oil and 3 parts of a siccative.

Flotation Agents

Ammonium tall oil soaps are of interest as flotation agents. These, according to U.S. patent 2,238,021, can be made by dissolving the oil in alcohol (methyl, isopropyl, secondary and tertiary butyl and amyl tertiary alcohol) and passing into the solution anhydrous ammonia, to yield an alcoholic solution of anhydrous completely saponified ammonium tall oil soap. Another U.S. patent, No. 2,373,305 (1945), mentions the use of tall oil for the flotation of tungsten ore.

It is claimed by the patentees that an improvement in the concentration of carbonate-containing tungstate minerals and silicon-bearing gangue during the flotation step is conferred by the presence of a reagent combination of an ionic promotor from the group consisting of the higher aliphatic fatty acids, tall oil, and the ammonium, potassium, or sodium salts of fatty acids and tall oil; an alkali

salt of a dialkyl sulphosuccinate; and a gangue depressant. Promoters for acid minerals in froth flotation, agglomeration, tabling and stratification may be produced by the reaction of polyalkylene polyamines with tall oil at 230-240°C. This is covered by U.S. patent 2,312,387 (1943).

An interesting use for sulphonated tall oil is suggested by U.S. patent 2,423,314 (1947) in the concentration of oxidised iron ores from mixtures which contain acidic gangue and both magnetic and non-magnetic iron oxides. A reagent made up of 75 per cent tall oil, 20 per cent ammonium sulphate derivative of diethylene glycol laurate and 5 per cent octyl alcohol is recommended for use as a stable flotation agent, possessing strong collecting properties for baryta ores and depressing properties for siliceous materials, limestones, oxides of aluminium, iron, manganese and titanium. This flotation compound is described in U.S. patent 2,378,552 (1945).

In the manufacture of fibre bonds and the impregnation of paper, increasing use is being made of tall oil. A Swedish patent No. 109,319 (1943) covers the employment of calcium salts of tall oil acids, which have been purified by an oxidation process or treated with sulphur chlorides, for the impregnation of paper or bond.

A Canadian patent, 434,183 (1946), describes the production of a pressed fibrous product made with the aid of tall oil. An emulsion of the oil made by heating it with water at 140°F. is added to the fibrous material. The oil is then precipitated into the fibres by an acid-reacting metallic salt, the suspension formed into a coherent mass, dried and consolidated at a temperature between 350 and 500°F. under a pressure of 500 to 1500 p.s.i. The hard bond produced in this way contains 2-10 per cent tall oil, has a density of 50-72 lb. per cu. ft., and varies in thickness from 0.1 to 0.25 in.

Replacing Sulphonated Castor Oil

In the manufacture of coated paper, tall oil is assuming some importance as a replacement for sulphonated castor oil; according to some authorities it increases the folding endurance and bursting strength. High tear resistance is imparted to test sheets with clay casein coatings containing sulphonated tall oil. Compositions made up of 2-8 parts sulphonated tall oil, 6-16 parts zein, 0.3-0.5 parts caustic soda, 60-200 parts water and 100 parts china clay are claimed to have advantages over standard coatings because of their lighter colour, elimination of frothing difficulties, improved printing characteristics and ease of use in connection with a roll-coating machine.

American patent 2,370,268 describes methods of using tall oil in such compositions.

The use of tall oil in the manufacture of synthetic or soapless detergents is of topical interest and has produced a number of patents. A British patent, 491,960 (1938) was filed describing one such detergent made by saponifying the oil with an excess of an alkaline solution, adding a grease solvent and sufficient phenol to neutralise the excess of alkali. The U.S. patent 2,290,583 (1942) discloses a method of producing tall oil detergents by chlorinating the fatty acids of tall oil and reacting with a glycerine-oleum mixture and finally neutralising. The finished product is said to be useful as a dispersing, emulsifying, penetrating, solubilising, washing and wetting agent.

Separating the Fatty Acids

Tall oil consists of a complex mixture of fatty acids in the forms of oleic and linolenic acids, with small amounts of palmitic and isolinolenic acids and resin acids such as oxyresinic and abetinic acids. Various processes have been suggested for separating the valuable fatty acids from the resin acids. Hydrogenation followed by selective absorption is one of the best methods and offers important advantages over the more conventional fractional distillation. It is less expensive and gives greater yields.

If tall oil is hydrogenated to reduce the component acids to two, these can be isolated by passing a solution of the mixture through a column containing activated carbon. In this way stearic acid can be isolated from abietic acid. Fractional crystallisation is sometimes used for isolating hard fatty acids and abietic acids from hydrogenated tall oil. U.S. patent 2,280,842 (1942) offers a method of isolating fatty acids from tall oil on these lines.

Metallic salts or soaps can be prepared from tall oil, for use in the mildew proofing and waterproofing of textile fabrics. For the saponification, metallic salts, such as carbonates, chlorides, hydroxides, or oxides of metals, are used. To ensure that no soluble alkali soaps are formed alkali impurities have to be rigidly excluded.

Satisfactory vehicles for inks can be made by reacting tall oil with lime and then mixing with a small percentage of linseed or other drying oil. The oil is heated to 180-200°C. with 5 per cent

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Alcohol from Cassava

U.S. Develops a Cheaper Extraction Method

A NEW and cheaper U.S. method of extracting alcohol from the South American cassava plant, which is said to open the way to far wider use of this source of high-quality alcohol, was reported to the American Chemical Society recently in a paper by three chemists of Joseph E. Seagram & Sons, Louisville, Kentucky.

The cassava, source of the starch used in making tapioca, sprouts from 3 to 9 ft., and is supported by a cluster of tapering cylindrical roots 3 ft. long and 6 to 9 in. in diameter. Starch accumulated in the roots can be converted to fermentable sugars by submerged culture fungal enzymes in the new process, which is "considerably less costly" than the barley malt process used in the U.S.A., the paper said. It also anticipated that the manufacture of fungal enzymes would be feasible in other countries and that cassava could be further exploited for the production of alcohol.

The paper, by C. Teixeira, A. A. Andreasen, and Paul Kolachov, noted that tapioca is a principal export of Brazil and other South American countries, and that Brazilian industry relies on the cassava roots, which contain 25 to 30 per cent starch, for the production of alcohol and the manufacture of glue and textiles. The starch is also added to wheat flour to reduce the amount of wheat that must be imported.

Cassava alcohol is described as a high-grade product used in the finest beverages and perfumes. The alcohol is now exported principally to Switzerland, where it is in great demand, stated the paper.

Brazil's cassava output has increased considerably in recent years, reaching 9 million tons, with an estimated value of $115 million in 1946. The herbaceous shrub is also cultivated extensively in tropical West Africa and the Malay archipelago, as well as in other South American countries. Yet, in spite of great possibilities offered by the cassava plant and its early discovery during the colonisation of Brazil, its use is still not extensive, the chemists said.

Listing the methods used in the past to extract cassava alcohol, the paper declared that microbial enzyme preparations offer the most inexpensive, efficient, and successful conversion agents. Extensive research in the production of mould bran and liquid fungal submerged culture preparations had resulted in the possibility of further exploitation of starchy raw materials for the production of alcohol. The use of submerged culture fungal enzymes for conversion resulted in higher yields of alcohol than could be obtained by either barley or corn malt.

THE WIDENING FIELD OF TALL OIL

(*continued from previous page*)

hydrated lime. The temperature is then raised to 220°C. and held for 5-6 hours. This is the subject of U.S. patent 2,416,676.

Some lubricants have been based on tall oil and one of the most interesting processes is outlined in U.S. patent 2,385,912 (1945). This entails esterifying tall oil with glycerol and sulphurising the esters with sulphuryl halides or oxyhalides, active or elemental sulphur. The resultant product is blown with air to remove all disagreeable smelling volatile products. It is claimed that the esters made in this way have the desirable lubricating properties—oiliness, tenacity, wetting power, compressibility and anti-corrosive properties.

Some interesting developments can be anticipated with some confidence by the plastics industry, judging by the large number of patents covering processes of making resinous compositions. One such patent discloses a method of esterifying polymerised tall oil with saturated alcohols in a mixture of vinyl ethers, which have a plurality of vinyl groups in the molecule, to obtain interpolymerisation products capable of wide use.

There is no doubt that tall oil is assuming importance as an industrial raw material, or that it merits the consideration of chemists in industries producing adhesives, binders, cleaners, cutting oils, disinfectants, drawing oils, dust palatives, flotation agents, weed-killers, lubricants, paints, plasticisers, polishes, waxes, rust inhibitors, soaps, wetting agents, etc. Although the composition and quality of tall oils vary considerably with climatic conditions and the geographic location of the pulpwood, it is possible by clever blending and rigid laboratory control to procure oils having the highest degree of uniformity.

THE CHEMISTRY OF FUR DYEING

Use of Wide Range of Coal Tar Intermediates

SOME millions of fur skins are handled in this country every year, and all require to be dressed and 75 per cent require to be dyed. The aim of the fur dyer is to imitate the colours of the natural furs at their best and also to produce other colours and effects as required by fashion, the most popular hues being greys and browns.

There is a very wide variation in the nature and behaviour of the constituent fibres of furs. While the softer under fur resembles wool and can be dyed with comparative ease, the long and resistant guard hairs vary from species to species treatment before dyeing.

The distribution and texture of these guard hairs varies from species to species and even from skin to skin, while a considerable variation in colour may also be encountered in the same skin. A further problem is presented by the leather, which on exposure to temperature much above blood heat would shrink and become partly gelatinised and on drying would be hard and brittle. Consequently, the dyer is restricted to materials which can be used in the cold, and this precludes the usual textile dyes such as are employed for wool or silk.

Another difficulty is that the materials used in dyeing may remove some of the leather-forming ingredients used in dressing, so that it is often necessary to redress skins after dyeing. Thus fur dyeing is one of the most difficult and at the same time one of the most fascinating branches of dyeing. Some of its problems and processes are unique.

Vegetable and Aniline Dyes

Up to 50 years ago, fur dyeing was carried out on a relatively small scale with vegetable dyes such as were used in the textile and leather trades, but with the addition of alkaline treatments known as "killings" to increase the affinity of the fibres for the dye. The aniline dyes discovered in 1856 have not been extensively used for fur dyeing, partly because of the unsuitability of the bright colours for furs and partly because of their poor affinity at low temperatures. To a limited extent, however, they are used in the production of fancy colours on white furskins for special purposes, the leather being treated to withstand a higher temperature.

Modern methods of fur dyeing may be said to have originated from discoveries patented 60 years ago by a German chemist, H. Erdmann, who found that certain diamino and amino-oxy derivatives of benzene, on treatment with oxidising agents such as hydrogen peroxide, produced colouring materials having a great affinity for fur and other animal fibres, which previously could be dyed only after long and drastic treatments. A further advantage of the modern methods is the wide range of shades produced by mixing, the range being so comprehensive that nowadays furs can be dyed in almost any colour and shade.

Modern Methods

The most important member of the group of dyes originates from the *p*-phenylene diamine, which in a chemically pure state is colourless. The dyestuff itself evolves only during the dyeing process through oxidation. Hydrogen peroxide serves as the oxidising medium and its effect is furthered by the mordants still remaining in the hair. An essential point is that the dye develops sufficiently at a normal temperature (30°C.), so that the leather is unharmed.

Among the most commonly used of these coal-tar intermediate products are *p*-phenylene diamine, which gives dull purple; chlorparaphenylene diamine (reddish brown); *p*-aminophenol (pinky brown), *o*-aminophenol (yellow), *p*-amino-dimethylaniline (grey), *p*-amino-diphenylamine (greenish-grey), and *m*-diamino-phenetole (brownish-grey). A wider range of shades can be obtained by the use of pyrogallic acid, resorcin, pyrocatechin and other phenolic substances in conjunction with the amines and aminophenols.

As a rule, two or more of these fur bases have to be mixed to give the desired result, so that the individual components can react with one another during the development of the dye. Different mordants used for the pre-treating in dyeing cause further complication in the structure of the colours produced, the results being occasionally disconcertingly unexpected.

The first stage in the oxidation of *p*-phenylene diamine is the formation of di-imine, $NH : C_6H_4 : NH$. This compound is very unstable and three molecules of it condense to form tetramino-diphenyl-para-azo-phenylene, an insoluble brown-black substance known as Bandrow-

ski's base. By intermolecular rearrangement this is capable of forming an azine claimed to be the leuco-compound of the trimolecular *p*-amino-diphenylamine.

The products of further oxidation are influenced by the *p*H value. On the acid side up to *p*H 7 the resultant dyeings are from the lightest straw colour to the deepest blue. On the alkaline side the dry process leads to a plain azine.

If *p*-diamine and *m*-diamine are combined, as is often the case in black dyeing, an indamine is formed as an intermediate phase and an unstable toluylene blue is obtained. On further oxidation this substance changes into a leuco-azine, which is a stable toluylene red.

Oxidation Colouring

The actual process of dyeing consists of dissolving the appropriate fur base or mixture of bases in water and adding sufficient hydrogen peroxide. The skins are then immersed in the dye bath and stirred at regular intervals to ensure even dyeing. The development of the oxidation colour may require as long as 12 hrs. to complete. The molecules of the fur bases penetrate into the fibres and are partly oxidised inside them, while a certain amount of oxidation product is also deposited in the dye bath and on the surface of the fibres.

Until 1914 practically all dyes of this type, including all the special dyes used in the fur industry, had to be imported from Germany. During the first world war, the manufacture of fur dyes was developed in Britain by the British Dyestuffs Corporation, one of the four main concerns which, by the merger in 1926, became Imperial Chemical Industries, Ltd., with the result that the British fur processing trade is now entirely independent of imported supplies and can obtain its full range of requirements from local sources.

Besides oxidation dyes the fur trade also uses mordants, as in the textile trade, those most widely employed being copper, iron and chrome. On a mordanted fur the colours produced are generally darker and faster, while the tone is altered according to the type of mordant used.

Since most fur skins which are plentiful are also coloured, the natural colour has frequently to be removed in order that the furs may subsequently be dyed to the pale and medium shades which are in demand. Nowadays about 25 per cent of all furs are bleached, the most satisfactory results being given by the use of hydrogen peroxide in an alkaline solution. The bleaching action on the pigmented part of the skin may be activated by the use of mordants, but careful control is necessary in order to avoid damage to the fibre structure.

Even skins of the same type are liable to behave differently in the dyeing process, so that individual sorting and evening-up in colour is often necessary. Great care has also to be taken in the selection of skins before dyeing and the rejection of those that are unsuitable. On the other hand the skilful combination of treatments and blending of materials can produce a very wide range of shades and effects.

Though many of the basic principles underlying the dressing, mordanting, bleaching and dyeing of furs have been established, there is still very much to be learned. Much work has been done by the Leeds school on the nature, physical and mechanical properties of animal fibres, while the fur dyeing industry is devoting considerable attention to the more technical aspects of processing and production.

This article is based on information supplied by C. W. Martin & Sons, Ltd., a leader in the fur dressing and dyeing trade, having a research department which is constantly carrying out investigations into the fundamental aspects of fibre processing. These findings are applied by the development department, which has for several years been devoting particular attention to improved methods of processing and to fastness of colours.

New Aluminium Powder

"SAP" (Sinter Aluminium Pulver) is the name of a new aluminium product, developed by the Swiss aluminium concern, Aluminium-Industrie A.G., Chippis. This powder—either pure aluminium or alloy powder—is stated to produce shapes or pressed profiles possessing all the mechanical characteristics of tempered aluminium alloys. Products made from SAP do not lose stability when heated for a prolonged period at high temperatures. Its expansion rate is claimed to be much lower than that of normal aluminium alloys.

SAP made from pure aluminium, without alloying substances, is said to have an electric and heat conductivity of 80 per cent of that of pure aluminium. It is believed that it may have uses where aluminium has been ruled out hitherto because of its relatively low heat resistance. Its physical characteristics—high conductivity, low expansion co-efficient and the absence of permanent change in length—would recommend it in particular for use in pistons. SAP is not yet being made on a commercial scale, but small samples, in the form of pressed bars, are being exported. Its price is reported to be substantially higher than aluminium equivalents.

HOME

Changed Telephone Number

The telephone number of the British Aluminium Co., Ltd., at Salisbury House, London, E.C.2 changes tomorrow to Monarch 4422.

Trophy for Australian Workers

Employees in the Explosives Division of I.C.I., Ltd., at Ardeer, have sent a silver punch bowl to their colleagues in the Deerpark factory in Australia for competition in the annual sports meeting there.

Best Week's Coal Output

Lord Hyndley last week congratulated British coal miners, expressing the National Coal Board's appreciation of the efforts of miners and managements which, last week, produced no less than 4,566,000 tons of deep-mined coal. This, he said, was a big achievement and the best output from the pits since the weeks of Dunkirk.

Neglected Peat Resources

The failure of Britain to develop her rich peat resources was stressed by Mr. David Murray at a meeting, recently, of the Royal Scottish Geographical Society. Although peat was an important source of chemicals, Mr. Murray urged that its obvious use—as a fuel—should be given priority. He cited the German and Russian uses of peat as a source of power, for electricity and transport.

"Giant Miner" Demonstrated

The 15-ton "mechanical miner," developed in the U.S.A. by the Joy Manufacturing Company (THE CHEMICAL AGE, *60*, 98), had its first trial in a British mine at Donisthorpe Colliery last week. The machine, which has seven electric motors giving 162 h.p., was demonstrated in operation by an American mining technician. It is to be used for experimental purposes at Donisthorpe Colliery.

Chemical Workers' Savings

Figures issued by the National Savings Committee, for concerns employing over 500 people in the chemical industry, show that during the quarter ended September last the average invested per savings group member was £4 18s. 7d. against £3 19s. 5d. the previous quarter. The national average for all industries is £4 5s. The total savings in the chemical industry was £241,389, over 25 per cent of employees saving through 94 National Savings Groups.

Textile Conference

Cheltenham will be the venue for the Textile Institute's 1950 conference, from June 6 to June 9 inclusive. An exhibition of instruments for the measurement of yarn irregularities is to be held.

Christmas Gifts

The Matron of the Olive Mount Children's Hospital, Liverpool, was presented, on December 21, with a large collection of toys by the employees of Evans Medical Supplies, Ltd.

Science Masters' Conference

The annual conference of the Science Masters' Association will be held at the University of Edinburgh from January 3-6, 1950. This is the first occasion in the 49 years of its history that the association has met in Scotland. The presidential address will be given by Sir Edward Appleton. Laboratory space has been set aside for demonstrations.

Scientific Films Census

A survey is being made by the Scientific Film Association of makers, owners and users of scientific films. It is intended to compile a reference catalogue of this information, giving the maker's name and address, the title of the film, its gauge and length of running time, and a brief synopsis. Such details are sought by the association at 4 Great Russell Street, W.C.1.

Machinery Imports

Following the removal on September 29 of import licensing restrictions on imports into the U.K. of machinery and plant from OEEC and other soft-currency countries, the Board of Trade points out that it is still necessary to apply for a "duty-free" licence. The dispensation in respect to import licences relates only to imports of machinery which cannot, at present, be procured within the United Kingdom

Soap Economy Tablets

A new soap product recently launched by A. Campbell and Co. (Kwik-Wash), Ltd., Hillington, Glasgow, is finding a demand from institutional buyers. Designed to save washing powder, soap, or other cleaning materials, the new product is a tablet of soluble detergent measuring roughly 1½ in. by 2 in. by 1½ in. It has been formulated to be used in the proportion of one tablet per pail of hot water, thus permitting a standard issue for cleaners' operations.

Next Week's Events

MONDAY, JANUARY 2

Society of Chemical Industry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. Dr. H. A. Thomas: "Electronic Techniques in Scientific Research."

Oil and Colour Chemists' Association

Hull: Royal Station Hotel, 6.30 p.m. Joint meeting with the Hull branch of the National Federation of Master Painters and Decorators.

TUESDAY, JANUARY 3

Society of Public Analysts and other Analytical Chemists

London: Imperial College of Science and Technology, South Kensington, S.W.7, 6 p.m. (Physical Methods group.) "Spectroscopy"; papers by A. A. Smales, R. A. C. Isbell and D. C. M. Adamson, followed by discussion.

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. Discussion: "Practical Plating Problems"; opened by C. Wharrad (past chairman, Midlands Centre committee).

Incorporated Plant Engineers

Cardiff: Grand Hotel, 7.30 p.m. (South Wales branch.) "Arc Welding."

WEDNESDAY, JANUARY 4

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7 p.m. J. D. Bolckow: "The Lay-out and Equipment of a Modern Welding Shop."

Institution of Works Managers

Wimbledon: Town Hall, 6.45 p.m. (S.W. London sub-branch.) R. Pugh: "The Value of Publicity in the Works."

THURSDAY, JANUARY 5

Institute of Packaging

London: Waldorf Hotel, Aldwych, W.C.2, 6 p.m. A. S. Wharton (Phillips Electrical Industries, Ltd.): "Packaging Inspection."

Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. T. P. Hoar: "Corrosion Testing."

London: 4 Grosvenor Gardens, S.W.1, 7 p.m. L. A. J. Lodder: "Zinc Casting Alloys: Their Development and Use."

Leeds Metallurgical Society

Leeds: University, 7 p.m. Film: "The Bragg Soap Bubble."

Oil and Colour Chemists' Association

Newcastle: Royal Station Hotel, 6.30 p.m. W. Hancock: "Some Considerations of the Mechanics of Paint Milling."

Incorporated Plant Engineers

Peterborough: Eastern Gas Board, Church Street, 7.30 p.m. G. W. S. Burdett: "Machine Tool Development."

FRIDAY, JANUARY 6

The Paper Makers' Association

Manchester: (Technical section, northern division.) F. A. Craig: "Dyestuffs and their Application to Paper."

SATURDAY, JANUARY 7

British Interplanetary Society

London: Tudor Room, Caxton Hall, 6 p.m. K. W. Gatland and A. E. Dixon: "The Circum-lunar Rocket."

PERSONAL

COLONEL H. C. SMITH, deputy chairman of the Gas Council, has been re-elected president of the British Road Tar Association for the third successive year. Other officers appointed for the 1949/50 session were: MR. G. A. HEBDEN, director and general manager of the South Yorkshire Chemical Works, Ltd., who represents the coke oven interests, and MR. STANLEY ROBINSON, managing director of the Midland Tar Distillers, Ltd., re-elected vice-presidents; and W. K. HUTCHISON re-elected honorary treasurer. MR. J. DAVIDSON PRATT, director and secretary of the ABCM, is chairman of the managing council.

The honorary degree of Doctor of Science is to be conferred by Leeds University on May 10, 1950, on EMERITUS PROFESSOR ROBERT W. WHYTLAW-GRAY, who was professor of chemistry at Leeds from 1923 until 1945. He was also chemical adviser to the Chemical Warfare Committee during the 1914-18 war and was the British representative in 1940 on the Committee on Atomic Weights of the International Union of Chemistry.

DR. GEORGE GRANGER BROWN, of the University of Michigan, has been appointed director of engineering for the U.S. Atomic Energy Commission. He is particularly well known for his work in the field of distillation, has been on the chemical engineering staff at the university for 25 years and has been head of the department since 1942.

OVERSEAS

Metals Decontrolled in Sweden

After nearly 10 years, Government requisitioning of tin, lead, and metal alloys finished in Sweden on December 10. Import licences are still required when purchasing these metals abroad.

Aluminium Houses for Pakistan

An aluminium house under construction in Karachi, the first of its kind in Pakistan, by a London aluminium engineering company, has been inspected by Mr. C. N. Ahmed, Pakistan's Minister of Industries, who expressed confidence that the method would be widely adopted in Pakistan.

Largest British Petroleum Source

Canada's petroleum production in the Province of Alberta for the first eight months of this year, of 12,730,000 barrels was 93 per cent higher than in the corresponding period in 1948. Canada now ranks as the largest British oil producing country. Large scale refining developments are taking place in Western Canada.

Nitrogen Production in Norway

The new Norwegian nitrogen plant at Glomfjord, north of the Arctic Circle, is reported now to be in operation with a capacity of 150 tons daily. Production will be sent by boat to Eidanger to produce 250,000 tons of nitrogen fertiliser annually. Glomfjord has an electrical convertor of 72,000 kW, one of the largest in Europe.

Tunisian Oil Concessions

The *Official Gazette* of Tunisia contains the registration of two companies formed to exploit the oil wealth of Tunisia. The first, the Société Nord-Africaine des Pétroles, formed with an initial share capital of Fr. 1500 million, of which 65 per cent is held by the Gulf Oil Corporation and the remainder by the Société d'Etudes de Recherches et l'Expoitation des Pétroles de Tunisia, has obtained a concession in the region of Sfax, covering nearly 5 million acres. The second, the Compagnie des Pétroles de Tunisie, is a joint organisation of the Shell group, which holds 65 per cent of the initial share capital of Fr. 300 million, and of the Sociéte Nord-Africaine. It will exploit a concession in the Sousse region, extending over some 2.5 million acres. Should oil be discovered, preference is to be given in supplying the needs of Metropolitan France and local requirements.

Hamburg Refinery Re-opened

The Shell Group's oil refinery at Hamburg, which was greatly damaged during the war, was re-opened last month. Crude throughput will be about 440,000 tons annually.

Dismantling Bavarian Aluminium Works

U.S. authorities in Bavaria have requested the Bavarian Government to begin the partial dismantling of the Töging plant of the Associated Aluminium Works, Ltd. Capacity of the plant will be reduced by about 35 per cent.

New Swedish Coke Works

Permission from the building control authorities to construct a new coke works costing between nine and 10 million kronor, has been received by the Oxelösund Iron Works, A.B. The new works is expected to have a daily capacity of 420 tons compared with the present output of 310 tons daily.

Improved U.S. Moulding Compounds

Three new Hycar-phenolic moulding compounds have been developed by the U.S. General Electric Company's chemical department. The products are an asbestos-filled, a cotton flock-filled, and a fabric-filled compound. They are claimed to have unusual shock, vibration, and fatigue resistance.

Soviet Atomic Research Boast

A new device in nuclear research, claimed to combine the advantages of the American cyclotron and betatron, has been developed in Russia, according to the Soviet News Bureau in Berlin. The machine, designed by Professor W. L. Weksler, is said to impart much greater energy to electrons than does the betatron. "Any desired change in the nuclei can be carried out with this machine," the report said.

Electronic Heating for Welding

Electronic heating used in conjunction with welding work was found to be a valuable time-saver recently when it was used in the repair of a fractured shaft of a 25-megawatt steam turbine at the Bunnerong Power House at Botany, New South Wales. The ability of the equipment to create localised heat of controlled intensity was found of great value for pre-heating, for normalising the turbine shaft during welding sequences, and for removing and refitting large sealing sleeves.

INDIA'S CHEMICALS AND FERTILISERS

Important Raw Materials Lost to Pakistan

INDIA, before the war, lacked a well developed chemical industry, but considerable impetus was given during the war to the development there of acetic acid, lead acetate, sodium and potassium bichromates and caustic alkalis. At the time of partition, her chemical industry may be said to have been a growing one, but it received a damaging setback as the separation left some of its important raw materials in Pakistan. Particularly, India was then deprived of the sulphur resources of Baluchistan and the salt and gypsum of the Punjab.

Sulphuric Acid Needs

The estimated annual requirements of sulphuric acid of undivided India (for users almost entirely in the Indian Union) amounted to 80,000 tons, according to a survey, by Mr. Rowland Owen, senior U.K. trade commissioner in India, of that country's economic and commercial conditions (HMSO, 4s.), from which the following particulars of her chemical economy are taken. Production is widely dispersed, West Bengal and Bombay having six major sulphuric acid plants each and Bihar four. The total rated capacity of these units together is about 100,000 tons per annum; but peak production in 1945 amounted to only 62,500 tons. Production during 1948 amounted to about 80,000 tons, a quantity which appears to be in excess of the capacity of local consumers to absorb.

Supplies of sulphur in the immediate pre-partition period were furnished mainly by U.S.A. (over 100,000 tons in 1946-47), and since partition by the same source (over 300,000 tons in six months ending September, 1948).

The estimated annual caustic soda requirements of the Indian Union amount to about 70,000 tons, divided as follows according to official estimates:—

	Tons
Soap	24,000
Cotton textiles	16,000
Paper	9,000
Chemical industry	2,100
Vegetable ghee and oil refining industries	1,500
Other miscellaneous requirements	17,000

For the bulk of its caustic soda requirements the country is dependent upon imports. Annual production is about 3000 tons a year but capital equipment is arriving which should result in an increase. Supplies have been received since partition mainly from the U.S.A. and the U.K. (467,000 and 247,000 tons respectively in six months ending September, 1948).

The claims of the Mettur Chemical and Industrial Corporation to protection were investigated by the Indian Tariff Board in 1946. The decision of the Government of India on the board's recommendations was to grant a subsidy.

The estimated annual consumption of soda ash amounts to 112,000 tons, mainly in the paper, textile, glass and silicate industries. The three producing units could account between them for 56,000 tons a year, but production has been running far below capacity and in 1948 amounted to 28,200 tons. Imports during the same period are believed to have been about 90,000 tons and at the time of writing the market is in a state of glut.

Protected Chemical Production

The Tariff Board considered in the post-war years the claims to protection of a number of producers of chemicals, with the following results. (Statistics of consumption and production have been taken from Tariff Board reports):—

Chemicals	Annual consumption in undivided India	Domestic production	Govt. of India decision on protection
	tons	tons	
Calcium chloride	850–1500	800–1000	Protection for the one applicant granted.
Sodium thiosulphate	600–800	1120 (capacity)	Granted
Sodium sulphite and sodium bisulphite	650–750	690 (capacity)	
Phosphoric acid	30–40	100	Granted. One applicant.
Sodium phosphate	200–300	150 phosphates	Granted. One applicant.
Acid calcium phosphate	No separate statistics available		Rejected
Bichromates	2400	3000–4000	Granted
Sodium sulphide	2000–3000	4800 (capacity)	Rejected
Sodium and potassium metabisulphites	15–20	Small	Rejected
Stearic acid	700–1000	760 (capacity)	Granted
Oleic acid	400–500	720 (capacity)	Granted

Other chemicals produced in India are hydrochloric acid, potassium chlorate, alums, acetic acid, chlorosulphonic acid, potassium nitrate.

Details of the most important imported chemicals are given in the following table:

Commodity	1947–48 (undivided India) '000 cwts.	Rs. Lakhs.	6 months ending Sept., 1948 (Indian Union) '000 cwts.	Rs. Lakhs.	Leading sources of supply
Acetic acid...	39.8	32.3	4.2	3.9	U.S.A.
Tartaric ...	2.3	4.9	.9	1.4	Spain, Italy
Arsenic and oxides ...	16.4	8.6	1.1	.6	Portugal, Burma
Calcium carbide ...	85.7	18.9	38.3	9.3	Norway, Canada
Copper sulphate ...	26.2	6.3	5.3	2.2	U.K.
Sodium bicarbonate	104.7	14.1	103.0	16.7	U.K.
Borax ...	181.8	40.5	14.5	3.3	U.S.A.
Sodium carbonate ...	1,359.0	132.9	1,476.3	259.0	U.S.A., U.K.
Sodium hydrosulphite	62.2	61.3	23.7	19	U.K., U.S.A.

Any attempts to base estimates of demand on consumption of chemical fertilisers would be misleading. The soil of India has been for generations consistently undernourished. Indian consumption of nitrogenous fertiliser has always been far lower than the minimum required for reasonably productive use of the cultivated areas. In 1938-39 domestic production (of approximately 23,000 tons) of sulphate of ammonia was supplemented by imports of 76,700 tons. At the present time about 20,000 tons is produced annually as a by-product from the coking of coal.

Sulphate of Ammonia

In 1944 a technical mission from the U.K. provided by I.C.I. and the British Chemical Plant Manufacturers' Association, carried out an investigation and reported to the Government of India regarding the problems involved in the manufacture of sulphate of ammonia in British India in quantities up to 350,000 tons per annum. As a result it was decided to erect at Sindri in Bihar a single factory to produce the quantity stated, and to entrust the work to a U.S. firm of consultants working in collaboration with a U.K. chemical plant manufacturer. The factory is in course of erection.

Three major problems remain to be solved, however, before planned production can be carried out; first, supply of raw material (the gypsum deposits recommended for exploitation by the technical mission are, as stated above, now in Pakistan). Next, the provision of transport for supply of raw material and distribution of 1000 tons a day of finished products. Lastly, the provision of managerial and technical staff for the factory.

The technical mission considered the possibility of the use of ammonium nitrate, but took the view that in conditions of storage, transport and application likely to be found in India, sulphate was preferable. A factory in Travancore recently commenced production and hopes to achieve 45,000 tons a year. A factory in Mysore produces 5-6000 tons a year.

Imported Nitrogen

The table below shows the allocation of nitrogen to India from external sources during 1948-49 and, where available, the types and quantities of chemical fertilisers in which form it will be delivered.

(Fertilisers are imported on Government account from different sources according to the allocations made by the World Food Council. The quota allocated from the U.K. is purchased through the Indian Stores Department, London.)

Source	Quantity of nitrogen Metric tons	Types and quantities of fertilisers
Total—all sources	28,345	
of which from:		
U.K.	7,940	37,212 long tons sulphate of ammonia.
U.S.A. ...	4,000	19,213 long tons sulphate of ammonia.
Chile	3,960	25,144 long tons sodium nitrate.
Belgium ...	5,273	5,500 tons nitrate of soda. 19,500 tons ammonium sulphate. 2,000 tons di-ammonium phosphate.
Canada ...	4,172	8,520 tons ammonium nitrate 4,450 tons ammonium sulphate. 8,000 tons ammonium phosphate.
Italy	3,000	14,500 tons sulphate of ammonia.

In addition, India has secured from the U.S.S.R. a quantity of ammonium sulphate outside IEFC allocations, which will amount at least to 18,000 tons and may amount to over 60,000 tons.

The present consumption of phosphates in India is of the order of 30,000 tons annually. This is made up of superphosphates manufactured from imported rock phosphate and bone superphosphates made by treating crushed bones with

sulphuric acid. This latter method, long regarded in advanced industrial countries as outmoded, is beginning to lose favour in India, where factories are turning over gradually from the production of superphosphate from bones to rock phosphate. Bone superphosphate is not ordinarily imported; local production is estimated at 5000 to 10,000 tons annually.

Superphosphate Plant Capacity

The installed plant capacity, actual and planned, for superphosphate manufacture is as follows:—

	Thousand tons
Present annual capacity	60
Plant under erection	10
Two plants already licensed	20
Plant for which capital issue already sanctioned	10
	100

Actual production was, however, in the summer of 1948 running at the rate of 10,000 tons a year only, due: to the high price of bones; cost of production of sulphuric acid; lack of adequate supplies of rock phosphate. Such superphosphate as is imported in small quantities each year is allocated to sugar mills only for sugar juice clarification, as there is a religious prejudice against the use of bone superphosphate for this purpose.

Although potash is potentially recoverable from Indian saline earths no systematic large-scale exploitation takes place, although about 15,000 tons of potassium nitrate are believed to be produced from such sources annually. Prior to 1939, undivided India consumed probably about 3500 tons of potassic fertilisers.

Drug Industry

As regards drugs, pharmaceuticals and fine chemicals, although some development took place in the industry during the war it remains on a comparatively small scale. Synthetic drugs produced in India are mostly made out of imported materials. In proprietary and patent medicines, the U.K. and U.S.A. are outstandingly the largest suppliers. In the fine chemicals field, there has been strong competition from the U.S.A., Switzerland and Holland. Good demand exists for laboratory and research chemicals although delivery has been slow owing to the difficulty of obtaining deck space. (These goods have to travel as deck cargo by law.)

Continued Protection for Indian Aluminium Industry

INDIA's Parliament at New Delhi has decided to continue for three years the protection granted to the country's aluminium industry in accordance with the Tariff Board's recommendations. The board had recommended protection on the principle of enhancement of import duty (30 per cent *ad valorem*) and the payment of a bounty to promote development of the industry and prevent price rises.

Giving comparative figures of the prices of non-ferrous metals, Mr. Neogy claimed that the price of aluminium had come down from Rs.84 in 1939 to Rs.75 per cwt. Devaluation had afforded some aid to the industry because the main competition came from Canada whose products would now cost about 28 per cent more.

It has been estimated that, on the present basis of consumption of 12,000 tons in India, the production leaves a gap of 9000 tons to be supplied by imports. Growing industrialisation of the country will produce an enlarged demand and increased production is essential.

Added to the 30 per cent protective duty, the consumer pays a "specific" duty of Rs.121 per ton of imported aluminium and the Indian industry is to be subsidised for the next three years to the extent of the difference between the fair selling price of the products, having regard to the respective costs of production, and the fair selling price of similar imported articles.

It is estimated that the consumer pays in all over 60 per cent more than the cost of aluminium, to keep the Indian industry going. The pioneers of the industry in India are two companies, one entirely Indian, and the other jointly owned by Indians, Canadians and the British, the Indian share being one-third.

The combined production of the two companies during 1948 was 3362 tons.

Indian Steel

The Indian Government has granted the Steel Corporation of Bengal a loan of Rs.50 million, to be spread over three years, towards financing its expansion programme. Present production of the corporation is 250,000 tons annually and is expected to increase by about 200,000 tons when additional plant has been installed.

MODERN SYNTHETIC RUBBERS. H. Barron. London: Chapman & Hall, Ltd. Third edition, revised and enlarged. 1949. Pp. xix + 636. 45s.

Most people with interests in the manufacture, properties, uses, and examination of synthetic rubbers will be familiar with the previous editions of this work, which first appeared in 1942. The new edition, while preserving the format of these, has been nearly doubled in size, and a considerable amount of information, especially from German sources, not available during wartime, has been included, together with developments in the U.S.A. and elsewhere, up to the middle of 1948. The large-scale production of synthetic rubbers is considered by the author to be the outstanding technical achievement of the war period—after atomic fission.

The first part of the book is devoted to the history, economics, and terminology of the industry. Production figures and costs, mainly in the U.S.A., of intermediate materials and synthetic rubbers are given and discussed, and numerous detailed tables show how the costs are actually derived. Descriptions of the chemical principles of polymerisation, copolymerisation, and emulsion polymerisation follow. The treatment is semi-popular.

A special chapter on the compounding of synthetic rubbers is included in this edition. The uses of added materials, fillers, accelerators, etc., and their effects on the properties of both natural and synthetic rubbers are reviewed, and tabulated data supplement the text.

The various kinds of synthetic rubbers are considered individually at great length under the categories: elastomers, based on butadiene; elastenes, based on olefines; thioplasts, based on polysulphides; ethenoid elastics, based on the polyvinyl grouping; and elastoplasts, cellulose ethers.

The greatest value of the book is probably in the detailed descriptions of methods of treatment and of the distinctive properties and advantages or disadvantages of the various kinds of synthetic rubbers in comparison with those of natural rubber.

For the analytical chemist, the final chapter, which covers qualitative and quantitative examination and testing, will be extremely useful.

FUNDAMENTALS OF SYNTHETIC POLYMER TECHNOLOGY. R. Houwink. 1949. New York: Elsevier Publishing Company, Inc. London: Cleaver Hulme Press, Ltd. Pp. xii + 258. 25s.

This is No. 9 of Elsevier's polymer series on the chemistry, physics and technology of high polymeric and allied substances, and is outstanding among the abundant literature on plastics. It touches the fundamental background of the chemical and physical factors in the preparation and uses of these substances; suggests solutions to some of the many manufacturing problems. It presents also a discussion of the properties and of the structure of all the chief groups of industrial plastics. The latter is uncommon. An endeavour is made to give the views and methods prevailing in the three chief centres of polymer research—North America, Great Britain and Europe, and the further outlook in research work and application.

The book is divided into 16 chapters, beginning with the chemistry of polymers and their classification. Bonds inside and outside the molecules, physics and colloid chemistry, properties and standardisation, testing and processing of polymers, etc., are covered in four chapters. A section is devoted to the various derivatives based on ethylene, phenole, aniline, the carbamides, carboxylic acids, the cellulose, proteins and natural rubber. Synthetic rubbers, silicones and miscellaneous polymers are surveyed in separate chapters.

The book concludes with economic aspects of the so-called "plastics age," or rather "plastics and elastics age." There are 67 instructive tables, 195 illustrations and numerous well selected references. The book claims a place in every chemical library, and should be of value to everyone connected with the plastics industry.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

LONDON VARNISH & ENAMEL CO., LTD. (M., 31/12/49.) November 28, letter of hypothecation securing Rs.500,000, to Mercantile Bank of India, Ltd.; charged on all stocks of varnishes, paints, enamels, etc., stored or to be stored in India. *Nil. June 14, 1949.

Satisfactions

BRITISH CELANESE, LTD., London, W. (M.S., 31/12/49.) Satisfaction December 2, of second debenture stock registered September 24, 1946, to the extent of £11,412.

BRITISH DIESEL OIL & PETROL CO., LTD. (formerly L. T. C. DISTILLATES, LTD.), London, S.W. (M.S., 31/12/49.) Satisfaction November 30, of debenture registered April 4, 1938, to the extent of £6000.

LONDON VARNISH & ENAMEL CO., LTD. (M.S., 31/12/49.) Satisfaction November 28, of letter of hypothecation registered October 15, 1949.

Company News

Bowmans Chemicals, Ltd.

Profits for the year, after providing for taxation amounted to £6967 and a balance of £4639 was brought forward from 1948. The directors recommend a final dividend of 7½ per cent (less tax) on the ordinary shares, making a total of 10 per cent for the year ended October 31.

Brown Bayley's Steel Works, Ltd.

Net profits for the past year were £233,571 (£271,029). £99,356 was spent on buildings and plant extensions and £200,000 transferred to fixed assets replacement reserve.

South Durham Steel & Iron Co., Ltd.

A record profit of £1,361,785 for the year was shown. Dividends paid on preference and ordinary shares were equivalent to 3 per cent of that total. £761,000 was set aside for depreciation and future development.

Increase of Capital

The following increase in registered capital has been announced: HOWARD & SONS, LTD., from £250,000 to £1,250,000.

New Registrations

Martin Rubeck, Ltd

Private company. (476,101.) Capital: £20,000. Manufacturers of detergents, soaps, cleansers, etc. Directors: M. J. H. Rubeck and I. J. Rubeck. Reg. office: 2 Clements Inn, Strand, W.C.2.

Harley Products, Ltd.

Private Company. (476,153.) Capital: £1000. Manufacturers of degreasers of all kinds, cleaning substances, lubricants, oils, etc. Secretary: B. Wilson. Reg. office: 174-6 Upper Brook Street, Manchester, 13.

The FBI Register

THE most comprehensive FBI Register yet produced will be released in January next by the Federation of British Industries. This directory is building a reputation as an authoritative guide to most of the principal British sources of supply. The 1949-50 Register, published jointly by Kelly's Directories, Ltd., and Iliffe & Sons, Ltd., will catalogue nearly 6000 firms under 5000 cross-reference headings. Sections include Addresses, giving complete information on all FBI members, Brands and Trademarks, and a Products and Services section which has strong interest for overseas buyers.

Reduced Nickel Consumption

World consumption of Canadian nickel in 1949 is estimated to be about 15 per cent lower than in 1948, which was a record year, according to the International Nickel Company of Canada. This decrease was partly due to the American steel and coal strikes. The U.S.A. takes some 65 per cent, and the United Kingdom 20 per cent of Canada's nickel output. Extensive plant alterations to improve production methods and utilise lower-grade ores are proceeding.

Chemical and Allied Stocks and Shares

STOCK markets are closing the year firmly, helped by a rally in British Funds, following the success of the Agricultural Mortgage £3 million issue of 3½ per cent debentures, which commanded a premium up to 6s. 3d. in initial dealings. Industrial shares have been firm, although year-end influences kept business in check. Moreover, sentiment was affected to some extent by the statement by the FBI emphasising the need under existing conditions of continuing the policy of restraint in dividend payments.

The prevailing view is that the near-term outlook for markets will be governed in the main by the trend in British Funds. This in turn will probably depend on whether there is evidence that the Government broker will still be prepared to support gilt-edged should prices show signs of any sharp reaction.

In common with most industrials, chemical and allied shares are ending the year well below highest prices, but generally well above lowest levels recorded during 1949. Share values, in fact, showed a down trend for the greater part of the year. This culminated in sharp declines during November, when British Funds fell heavily, later rallying well when official support for gilt-edged was provided by the Government broker and Sir Stafford Cripps announced his intention to "squeeze the bears."

The coming year, with the General Election looming ahead, is bound to be one of vital decisions whether there is to be more nationalisation or abolition of restrictions on private enterprise and initiative. The prevailing market view is that as the election approaches there may well be a good upward trend in industrial shares on the possibility of a change of Government, unless in the meantime there is another dollar crisis. The latter, it is feared in the City, may develop over the next few months unless there is marked expansion in the export drive to the U.S. and Canada.

Imperial Chemical are changing hands around 43s., which compares with highest and lowest prices of 49s. 4½d. and 40s. 4½d. recorded during 1949. Monsanto 5s. ordinary have been up to 63s. 6d. and down to 48s. in the past twelve months, and are now 50s. 3d. Extreme levels recorded during the year by Fisons have been 61s. and 26s. 3d. comparing with the current level of 27s. 3d.; for Laporte Chemicals, 5s. units have been 11s. and 9s. and the current price 9s. 6d. Albright & Wilson (extremes 31s. 9d. and 27s. 3d.) are now 30s., while in 1949 Brotherton 10s. shares have been up to 21s. and are now 19s. 4½d.

F. W. Berk 2s. 6d. shares are 12s. 9d., comparing with highest and lowest of 15s. and 12s. 6d. during the year. Shares of companies connected with plastics have fallen heavily in some cases, notably British Xylonite, which have been up to 126s. 3d. and down to 51s. 3d. compared with the current level of 60s. De la Rue's extremes were 41s. 6d. and 19s. 6d.; the current level is 22s. 9d. British Industrial Plastics 2s. shares have had 1949 extremes of 7s. 3d. and 3s. 10½d., and are now 4s. 9d.

Among other shares, highest and lowest and current prices are: Boots Drug (57s. 6d. and 45s. 6d.) and 50s. 3d.; Glaxo Laboratories (£24⅜ and £16⅜) and £24¼; Tube Investments (£6 13/16 and £5 5/16) and £5 29/32; Lever & Unilever (49s. 6d. and 41s.) and 44s. 6d.; Borax Consolidated (64s. 3d. and 49s. 4½d.) and 58s. 3d. Turner & Newall have been up to 87s. and down to 69s., comparing with the current level of 74s. 9d. Ultramar showed the biggest fall in oils, extremes having been 38s. 1½d. and 6s. 9d.; the current price is 7s. Anglo-Iranian (extremes £9 7/32 and £6 25/32) are now £6⅞. Shell have been up to 78s. 1½d. and down to 57s. 6d. and are currently 66s. 10½d.

Export Licences Not Required

A FURTHER list of goods for which export licences are no longer required came into effect on Thursday, December 22, and included the following items:—Soaps of all kinds (other than ammonium soaps, ethanolamine soaps, metallic resinates, and scourers containing less than 6 per cent by weight of anhydrous soaps); arsenious oxide; mixtures of, or containing, potassium hydroxide and lithium hydroxide; potassium bicarbonate; potassium carbonate; potassium hydroxide (caustic potash); amino-salicylic acid. Licences will be required for naphthenic acid.

Relaxation of Import Restrictions

The Board of Trade announces the following correction to the latest relaxations of import licensing restrictions (THE CHEMICAL AGE, *61*, 868). Countries to which the relaxations do not apply should include: the Dominican Republic, Ecuador, El Salvador, Guatamala, Haiti.

Prices of British Chemical Products

Steady Demand Largely Met by Supplies

WITH the shorter week due to the Christmas holidays, most sections of the chemicals market have been dull, interest being mainly centred on the new contract rates. While a number of price alterations are confidently expected, a few only have been notified by manufacturers. These include hyposulphite of soda and sodium bisulphite, which have been increased by 22s. 6d. and 25s. per ton respectively. Ammonium chloride, grey galvanising and the fine white crystals, has been increased by 5s. per ton. Higher rates for soda ash are expected but details are not yet available. There is a fair amount of export inquiry, most of which is expected to find its way to the order books.

MANCHESTER.—Business has been virtually at a standstill throughout the greater part of the week, the textile and other chemical using establishments having been closed for relatively long holiday periods. A return to normal trading is not generally anticipated until after the turn of the year. Both in the home section and on the export side there is confidence that the demand for most heavy and light chemicals will then be actively resumed.

Price Changes

Rises: Ammonium chloride, salammoniac, sodium bisulphite, sodium hyposulphite, sulphur.

Reductions: Borax, boric acid.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9½d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £55; in 1-cwt. bags, commercial, granular, £35 10s.; crystal, £38; powder, £39; extra fine powder, £40; B.P.,

granular, £45; crystal, £47-£48; powder, £48-£48 10s.; extra fine powder, £49-£49 10s.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £63; crystal, £70; powder, £67 10s.; extra fine powder, £69 10s.; B.P., granular, £76 10s.-£79 15s.; crystal, £82; powder, £79 10s.-£81 15s.; extra fine powder, £81 10s.-£83 15s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 6½d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 9½d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107 per ton. (Nominal.)

Lead Carbonate.—British dry, ton lots, d/d, £115 10s. (Nominal.)

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £110.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £119 10s., orange lead, £131 10s. Ground in oil: red, £140 10s., orange, £152 10s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £127 15s. per ton, Ground in oil, English, under two tons, £146 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£119 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅜d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £20 14s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 per ton, d/d, in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £84 15s.; green seal, £83 15s.; red seal, £82 5s.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in December, £10 5s., rising by 1s. 6d. per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 18s. 6d., rising by 2s. 6d. per ton per month to June, 1950. National No. 2, £10 18s. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 10½d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d. per gal.; 99%, 3s. 1d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/140°, 22s. to 23s. per gal.; 90/160°, 21s. MANCHESTER: 19s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2½d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: December 22. The price of all unrefined and refined oils and fats is subject to possible revision as from January 1.

Taxation Reliefs for Industry

Easing the Burdens of Chemical Production and Research

RECENT modifications of income tax assessment procedure, in its applications to patents, plant maintenance, industrial buildings, etc., offer some degree of assistance to research workers as well as chemical engineering and manufacturing concerns. Some of the more important changes have been brought about by the Finance Act, 1949, which alleviates certain conditions imposed by the 1945 Income Tax Act.

Expenses incurred in securing a patent or registering a design are allowable deductions, although capital outlay (expenditure in purchasing patent rights) is not now outside tax law, as deductions from the profits account are allowed, normally by instalments over a period of 17 years. The vendor's tax assessment is on the amount received, and this can be charged over a period of six years, if preferred. Income from patent rights is accepted as "earned income" and so obtains the "earned income" allowance.

Charitable contributions are not ordinarily allowable as trading expenses, except where they are for the welfare of employees. Similarly, contributions to trade charities and to employers' organisations are only allowable if associated with that particular trade.

Contributions, even of a capital nature, made to universities, colleges and the like, in respect of technical education, are allowable deductions from profits for tax purposes.

In scientific research, certain items (*e.g.*, salaries or fees of workers, cost of materials, repairs, maintenance, etc.) are allowable as trading expenses. Furthermore, capital expenditure on pilot plants, laboratories, etc., is allowable, but the deductions operate yearly over a period of five years. Under the Finance Act, 1949, expenditure incurred from April 6, 1949, is to be deductible on 60 per cent for the first year and on 10 per cent for each of the remaining four years.

For depreciation of machinery and plant (which includes most fittings and fixtures) allowances for "wear and tear" operate by agreed yearly percentages according to the type of machinery, etc., plus an additional amount, roughly one-fourth of that allowed through the "agreed rates" procedure.

Introduced by the Income Tax Act, 1945, the "initial allowance," which applies where fresh machinery or plant is installed (new or second hand), has, under the Finance Act, 1949, been doubled, making it now 40 per cent of the capital expenditure. A balancing allowance also applies where fresh machinery is installed before the capital expenditure has been deducted by the other allowances.

An initial allowance also applies to industrial buildings, being 10 per cent for new buildings, plus an annual maintenance allowance of 2 per cent per annum, which applies to new buildings and those less than 50 years old.

Control of Freon Production

THE E. I. Du Pont de Nemours Company Inc., has filed an application with the Securities and Exchange Commission for permission to buy General Motors Corporation's interest (49 per cent) in Kinetic Chemicals, Inc., for $9.7 million. The chemical company was founded in 1930 by Du Pont and General Motors to manufacture the Freon fluorinated hydrocarbon refrigerants, widely used to-day in the electric refrigeration industry. Kinetic Chemicals has two plants in Deepwater, New Jersey, within the Du Pont manufacturing area, and the other in East Chicago, Illinois. The uses of Freon continue to increase and expansion of the present productive capacity is foreseen.

Another U.S. Synthetic Fibre

THE Union Carbide & Carbon Corporation, one of the leading U.S. chemical concerns, plans to take up the manufacture of synthetic fibres on a large scale. Its earlier contribution in the synthetic fibres field in 1937, Vinyon, did not have a success in world markets comparable with Du Pont de Nemours's Nylon. It is reported that Vinyon becomes soft at 150°F. The corporation has since developed another new synthetic fibre, Dynel, which does not soften when heated to water boiling point. The new synthetic fibre crimps like wool when heated. It is not inflammable and exhibits the other resistant characteristics of the synthetic filaments.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Coloration of polyamide fibres.—A. Butterworth, and P. F. Crosland. Feb. 10 1947. 632,083.

Liquid antiseptics.—E. B. Brown, M. H. Gorin, and H. A. Abramson. Feb. 20 1945. 632,084.

Manufacture of titanium pigments.—National Titanium Pigments, Ltd., J. T. Richmond, G. G. Durrant, and R. J. Wigginton. Jan. 8 1947. 632,191.

Production of hydrogen.—Anglo-Iranian Oil Co., Ltd., J. N. Haresnape, and S. Hesling. 632,192.

Catalytic cracking of petroleum hydrocarbons.—Anglo-Iranian Oil Co., Ltd., J. N. Haresnape, and F. W. B. Porter. Jan. 10 1947. 632,193.

Production of ammonium nitrate charges.—I.C.I., Ltd., W. R. Davis, and J. Buckingham. Feb. 7 1947. 632,201.

Process for refining light oil.—Koppers Co., Inc. Feb. 18 1946. 632,315.

Modification of glycerides.—Procter & Gamble Co., and W. P. Williams. Feb. 19 1947. 632,089.

Production of cellular materials from rubber, plastics and bituminous compositions.—Expanded Rubber Co., Ltd., A. K. Unsworth, A. G. Goodchild, and A. Cooper. Feb 26 1947. 632,208.

Process of producing a solid ethylene polymer and the product resulting therefrom.—Standard Oil Co. March 5 1946. 632,316.

Production of coatings on aluminium and its alloys.—American Chemical Paint Co. March 9 1946. 632,090

Catalytic processes.—I.C.I., Ltd., P. W. Reynolds, and J. G. M. Bremner. March 17 1947 632,219.

Surface-active compositions and method of producing same.—American Cyanamid Co. May 27 1946. 632,321.

Changing the composition of coke oven gas.—Koppers Co., Inc. Nov. 16 1946. 632,231.

Process for removing asphaltic or resinous material from mineral oil.—Universal Oil Products Co. April 27 1946. 632,328.

Separation of air.—British Oxygen Co., Ltd., P. M. Schuftan, and N. W. Roberts. May 14 1947. 632,329.

Manufacture of artificial filaments, fibres, threads and the like filamentary products.—I.C.I., Ltd., D. Traill, and J. E. L. Thomas. May 27 1947. 632,240.

Manufacture of ricinoleyl amines and the treatment of water to prevent foaming.—I.C.I., Ltd., May 31 1946. 632,242.

Azo dye compounds.—General Aniline & Film Corporation. Nov. 14 1945. 632,092.

6-Substituted thiouracil compounds and process of preparing the same.—Sterling Drug, Inc. July 30 1946. 632,094.

Amino-formaldehyde resin compositions incorporating latent curing agents.—British Industrial Plastics, Ltd. June 28 1946. 632,335.

Process of preventing or reducing corrosion by acidic steam condensate.—Anglo-Iranian Oil Co., Ltd. (K. B. Ross, L. A. Wilshere, and M. Benger). July 1 1947. 632,246.

Manufacture of monoazo-dyestuffs.—Ciba, Ltd. July 15 1946. 632,095.

Silicon carbide articles and methods of forming them. A. Abbey. (Carborundum Co.). July 4 1947. 632,247.

Azo dyestuffs of N-substituted anthranilic acids.—General Aniline & Film Corporation. July 19 1944. 632,096.

Manufacture of acyl derivatives of aceto-acetic acid amides.—Ciba, Ltd. July 30 1946. 632,341.

Methods of means for compounding gaseous mixtures.—British Oxygen Co., Ltd., and W. Edmondson. Aug. 1 1947. 632,343.

Method of recovering a stable liquid composition.—International Latex Processes. June 21 1944. 632,098.

Preparation of 1 : 4-dihalobutanes.—E. I. Du Pont de Nemours & Co. Aug. 8 1946. 632,346.

Manufacture of phenyl acetamide.—Distillers Co., Ltd., J. Howlett, and G. W. Jackson. Aug. 25 1947. 632,101.

Refining of kerosene.—Anglo-Iranian Oil Co., Ltd. (K. B. Ross, and R. K. Spiers). Sept. 10 1947. 632,349.

Stabilised polythene compositions.—E. I. Du Pont de Nemours & Co. Sept. 25 1946. 632,270.

Preparation of derivatives of phenthiazine.—Soc. des Usines Chimiques Rhone-Poulenc. March 1 1947. 632,277.

Curing synthetic copolymers containing allylic unsaturation.—United States Rubber Co. March 18 1947. 632,108.

Plasticised vinylidene chloride copolymers of the organic solvent soluble type.—British Cellophane, Ltd. Dec. 21 1946. 632,114.

Apparatus for halogenation of aromatic hydrocarbons.—Lummus Co. June 22 1942. 632,213.

Method of preparing aqueous dispersions of an acid reacting synthetic resin.—Monsanto Chemical Co. Dec. 10 1942. 632,024.

Dehydrogenation catalysts and method of preparing same.—Koppers Co., Inc. Dec. 31 1943. 632,350.

Manufacture of titanium in a cold-malleable form.—W. Kroll. July 11 1938. 632,564.

Manufacture and use of halogen-containing insecticidal organic compounds and the treatment of materials therewith.—Geigy Co., Ltd., and I. E. Balaban. July 28 1944. 632,635.

Apparatus and method for conditioning gases.—Delaware Engineering Corporation. Oct. 20 1945. 632,643.

Manufacture of steel.—Soc. d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine. Jan 24 1940. 632,428.

Separation of solid particles from air or other gases.—E. V. Giles. April 11 1946. 632,360.

Apparatus for washing gases.—H. Rathgeb. Aug. 27 1945. 632,654.

Fertilisers.—I.C.I., Ltd., J. W. R. Rayner, and J. H. Hudson. Aug. 27 1947. 632,577.

Process for the production of producer gas from carbonaceous material. — C. Arnold. (Standard Oil Development Co.). Sept. 11 1946. 632,505.

Evaporation of water from concentrated solutions of calcium nitrate.—Directie Van De Staatsmijnen in Limburg. Nov. 17 1941. 632,580.

Process for the preparation of vinylpyridines.—E. I. Du Pont de Nemours & Co., and L. F. Salisbury. Oct. 2 1946. 632,661.

Methods of separating mixed fatty acids. —Emery Industries Inc. July 29 1940. 632,583.

Moulding of organic plastic materials.—Dow Chemical Co. Feb. 7 1946. 632,586.

Separation of gaseous mixtures at low temperatures.—Petrocarbon, Ltd., and A. A. Aicher. Feb. 19 1947. 632,438.

Preparation of 2-amino-3-carboxymethylmercapto-propanoic acid.—Merck & Co. Inc. March 14 1946. 632,682.

Production of insecticides and synergists. —H. G. C. Fairweather. (U.S. Industrial Chemicals, Inc.). Feb. 25 1947. 632,589.

Hydantoin and method for obtaining the same.—Parke, Davis & Co. March 11 1946. 632,683.

Filters for gaseous mediums.—H. Astbury. April 5 1947. 632,385.

Apparatus for welding thermoplastic films.—Dunlop Rubber Co., Ltd., A. H. M. Hytch, and S. W. Gough. April 10 1947. 632,690.

Recovery of ammonia from gases containing it and the recovery of iron from waste pickle liquor.—Semet-Solvay Co. May 28 1946. 632,518.

Production of fuel gas.—Standard Oil Development Co. Oct. 18 1946. 632,386.

Method of treating tall oil in order to separate therefrom a fatty acid fraction as distillate. - Distillation Products, Inc. Nov. 9 1946. 632,698.

Process for the preparation of azo-dyestuffs on the fibre.—Soc. Anon. de Matières Colorantes et Produits Chimiques Francolor. May 14 1946. 632,595.

Manufacture of monoazo-dyestuffs.—Ciba, Ltd. May 31 1946. 632,699.

Processing of synthetic rubbers.—British Thomson-Houston Co., Ltd. May 29 1946. 632,390.

Method of coating with quartz by thermal evaporation.—R. C. Noyes. (Libbey-Owens-Ford Glass Co.). June 12 1947. 632,442.

Alkylation of paraffin hydrocarbons.—Universal Oil Products Co. Dec. 31 1938. 632,525.

Method of and apparatus for de-gassing lubricating grease.—N.V. De Bataafsche Petroleum Maatschappij. May 24 1940. 632,527.

Corrosion inhibition.—I.C.I., Ltd. July 22 1946. 632,533.

Process for the production of activated adsorbing products containing silicic acid. —A. Christiansen. Aug. 17 1946. 632,535.

Production of neutral phthalates.—Shell Refining & Marketing Co., Ltd., P. J. Garner, and G. Watson. Oct. 6 1947. 632,447.

Benzoic acid esters.—Sharp & Dohme, Inc. Oct. 5 1943. 632,561.

Process for the manufacture of organosilicon compounds.—Dow Corning Corporation, and J. T. Goodwin, Jun. July 1 1947. 632,563.

Evaporation of water from concentrated solutions of calcium nitrate.—Directie Van De Staatsmijnen in Limburg. Feb. 19 1945. 632,633.

Manufacture of N-alkyl or N-aralkyl derivatives of oxyazolidine-2 : 4-diones.—British Schering Research Laboratories, Ltd., J. S. H. Davies, and W. H. Hook. July 20 1948. 632,423.

Impregnated fibrous glass products.—Pittsburg Plate Glass Co. Dec. 1 1941. 632,983.

Fire-retardant and potentially heat-insulating compositions.—Albi Chemical Corporation. June 20 1944. 632,844.

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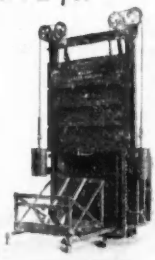
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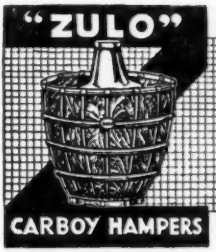

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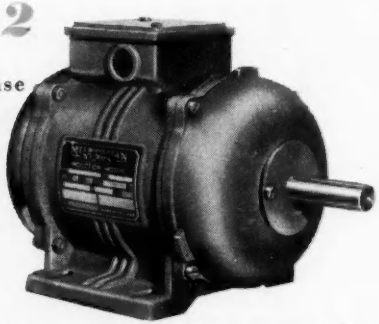

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